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NUTRITION—ONE FACTOR IN ORTHODONTICS*

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I APPRECIATE the complexities of my subject and the confusion surrounding it, but hope that I may be able to bring to you a point of view regarding the possible rôle of nutrition in your field which I have not found expressed in two standard textbooks on orthodontics or in any of the papers I consulted in the INTERNATIONAL JOURNAL OF ORTHODONTIA AND ORAL SURGERY.

McCoy's well-known text *Applied Orthodontics*[1] lists as predisposing causes for maloccluding teeth and attending deformations the following seven factors: (1) unknown causes; (2) endocrine unbalance; (3) metabolic disturbances; (4) acute or chronic infectious and deficiency diseases; (5) prenatal abnormalities; (6) congenital defects; (7) heredity. He lists the following fifteen determining causes: missing teeth; supernumerary teeth; transposed teeth; malformed teeth; abnormal frenum labium; premature shedding of the deciduous teeth; prolonged retention of the deciduous teeth; tardy eruption of the permanent teeth; loss of permanent teeth; improper dental restorations; intrauterine pressure and other pressure problems as related to sleeping habits, and posture; abnormal muscular habits; and malfunctioning muscles.

It will be noted that among the causes listed the only reference Dr. McCoy makes to nutrition as a factor of possible concern to the orthodontist is his mention of deficiency diseases. In the preface to his book, however, McCoy states: "No longer do we think of mechanical appliances as being the open sesame for meeting our problems, for in spite of noticeable advances in this field such agencies are inadequate unless used in a manner to augment inherent possibili-

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ties within the oral structure. At all times we are dependent upon responsiveness of growing, changing structures and bring to the fore the importance of having them in an optimum state of health so that growth changes induced by orthodontic means may proceed to the greatest advantage of the patient. In view of the fact that the majority of such are children, the pediatrician should in numerous instances be the collaborator of the orthodontist in the solving of related problems."

He continues: "This is the more appreciated when we realize that dental and oral anomalies represent conditions wherein aberrations of growth and function are manifest and that the extent to which they have developed represents the degree to which normal processes have been interfered with or inhibited at some period in the life of the child. Such unfavorable influences should be eliminated prior to or concurrent with orthodontic treatment. Many orthodontic children should receive a thorough medical examination so that any unfavorable constitutional factors could be uncovered and steps initiated toward their correction."

McCoy makes no mention of the possibility that, from a nutrition standpoint, a child may be a poor or a good orthodontic risk; he does not consider except in his reference to the pediatrician the possibility that a highly satisfactory diet prior to, during and after treatment may play an important rôle in bringing a case to a successful close. He does mention deficiency diseases as predisposing causes for malocclusding teeth. But deficiency diseases, such as beriberi, scurvy, xerophthalmia and advanced rickets, are the spectacular phases found in nutrition work just as the outstanding endocrine disorders are the spectacular phases found in endocrinology. These advanced conditions, whether caused by faulty nutrition or by endocrine imbalances, are not of great concern to the orthodontist because the symptoms are so striking that patients are or should be under treatment by physicians. The mitigated forms of endocrine disturbances, however, may be of concern to your profession as several investigators have pointed out.[2] In like manner, latent or subacute scurvy of long standing and varying grades of rickets may be of great importance to the orthodontist due to the relation of vitamins C and D and calcium and phosphorus to bone growth. This point will be taken up later in the paper.

We are all aware that the body structure and its physiologic functions are regulated in great measure by a highly specialized and finely balanced biochemical system, namely, the endocrine system. It is to be expected that this system would play a rôle in the problems associated with orthodontic treatment just as it plays a rôle in general health. On this point Marinus states: "Disturbances in the production of the growth hormone (pituitary) are capable of producing a marked alteration in the normal development of the jaws and teeth."[3] In a paper on "Heredity and Constitution of the Child," M. F. Guyer, Professor of Zoology at the University of Wisconsin, discusses internal factors in development and states: "This brings up the whole question of internal secretions as factors in development. Height, broad or slender form, length of arms and legs, shape of face, quality of voice, distribution of hair, or of fat on the body and even emotions are in greater or less measure conditioned by the relative functioning of the various endocrine glands during the earlier development and

later life." He says further: "And there is no reason to doubt that the amount and quality of the secretions in various family strains are as much the expression of hereditary factors as are many other individual characteristics. The hereditary aspects of these glands, however, are likely to be overlooked because they are also subject to environmental modifications and because one is accustomed to think of them in terms of their immediate activities instead of their genetic constitutions."[4] In other words, heredity is undoubtedly as great a factor in human problems as it has been found to be in the animal industry. In the animal industry, whether one considers meat or milk production, heredity and nutrition are two factors given great consideration.

The question may be asked: What does Guyer mean by environmental modifications of the endocrine glands? Would the toxemias of pregnancy, which include severe nausea, or a history of various illnesses and/or digestive disturbances in the child, resulting in dietary shortages of various kinds which in turn may bring about various grades of rickets (also malnutrition), be among the factors which bring about "environmental modifications"? The manifestations may not be of such magnitude that they can be readily detected by a physician but the imbalance might tend to play its rôle in disturbing the work of the orthodontist when and if orthodontic treatment is needed. In other words, in some instances, are nutrition problems resulting from environmental modifications capable of bringing about endocrine imbalances? At present there is no definite answer.

It was suggested that I discuss or classify the type of malocclusion and lack of arch development that has nutrition as a predisposing cause, but to my knowledge sufficient data have not been accumulated to warrant any statements. Detailed nutrition studies are not being made on the children who form the material for the extensive studies of Dr. Holly Broadbent of The Bolton Study Anatomical Laboratory, Western Reserve University in Cleveland. This is to be regretted, but no one is more cognizant of the difficulties involved in detailed nutrition studies than I am. Nevertheless, in time I hope to take part in such a study because more data of this nature are needed.

What relation has the incidence of rickets and latent scurvy of long standing to dental problems—in this case orthodontic problems? What does history teach regarding the change in the shape of the jaws and face of man? In his book *Rickets* published in 1922, J. Lawson Dick, an English physician and investigator, has a chapter entitled "Changes in the Bones and Face in Rickets" which should be of interest to every orthodontist.[5] Dick quotes an interesting comparison between Neolithic man (living about 10,000 years ago) and modern man as regards their teeth, from a book by the eminent anthropologist, Sir Arthur Keith, entitled *The Antiquity of Man*. He states: "Amongst modern Kentish folk, as is the case all over modern Britain, there is a tendency to crowding and irregularities of the teeth; the palate and jaws do not grow and expand sufficiently in youth to give room for a symmetrical eruption of the teeth. The nose is narrow and the palate contracted, and its vault is high. The teeth are not worn down as in Neolithic man: they are very liable to be attacked by caries. The front teeth when the jaws are closed do not meet edge to edge as in primi-

tive races; like blades of scissors they overlap, the lower passing behind the upper. In the skulls of Neolithic man all these modern characters are lacking. . . . The teeth of Neolithic men are regular in arrangement, the palates are well formed but in actual size the teeth possess the same dimensions as those of modern English people. All these changes which are appearing in the teeth and jaws of modern British people arise, we suppose, from the soft nature of our modern diet. We believe that were modern man to resume a Neolithic diet their teeth and palates would again be moulded in the ancient manner."

In commenting upon these statements of Sir Arthur Keith, Dick says: "The difference is, however, hardly capable of such easy solution. There can be no question but that profound changes have taken place in the modern skull within a remarkably short period of time, probably no more than between three or four centuries. But that the essential alterations in the bones of the face and skull are associated with a simple change in diet, interfering with the masticatory functions of the jaws and so retarding and altering their growth, does not suffice as an explanation of these well-marked variations. These notable alterations in the bones of the skull, and of the upper and lower jaws, are due to a profound constitutional modification taking place in the growing infant, a change which is in one sense pathological, in that it is due to what is considered a diseased state, but which in a very real sense is purely physiological in that it is the natural response produced by the adaptation of the growing organism to a widespread and intense alteration in environment. . . . In other words, these changes are associated with the origin and spread of rickets which has taken place in England during the last three or four centuries."

These statements of Sir Arthur Keith and Dr. Dick really mean that for several hundred years not only in parts of Europe but also in the United States and numerous other places a gigantic human experiment has been unwittingly carried on with at least two variables at work: (a) nutrition—change of diet from that of primitive man to that of the city dweller; (b) a change in environment—change from country life to life in cities and towns. Economics and environment have played and will continue to play a dominant rôle in the food setup of individuals which may or may not affect their health problems.

Students of rickets speak of it as a disorder due to climate and/or nutrition. Civilization with its increase of domestication led to the spread of rickets, but evidences of the disorder are found occasionally in skeletons of primitive man. Rickets is often regarded as an outgrowth of industrialism.

Not only should rickets be regarded as a deficiency disease but also it should be looked upon as an endocrine disorder because the parathyroid glands, which are concerned with the growth and calcification of the skeleton, do not appear to function normally in the absence of vitamin D which is supplied either by foods or by ultraviolet radiations (sunshine).

The experimental work on rickets emphasizes the importance of the phosphate ion in the production of normal bone.[6] Time does not permit of a discussion of the interrelationship of calcium, phosphorus and vitamin D, but it should be stressed that among other things vitamins C and D and phosphorus in addition to calcium are needed for the production of normal bone. Too much

emphasis has been placed upon the need of calcium for calcification even though Gamble has written as follows: "The results of experimental rickets emphasize the fact that the outstanding feature of the disease (rickets) is an incorrect metabolism of phosphorus rather than of calcium. Bones and calcium, however, seem to remain obstinately associated in the medical as well as in the lay mind with the result that organic calcium salts are still extensively prescribed with the hope of protecting the bones and teeth. As we have seen above, an excess of calcium in the food tends actually to prevent calcification by causing a precipitation of tri-calcium phosphate in the gastrointestinal tract instead of in the cartilage of bone. The charm of euphony is so great, however, that the slogan 'Calcium for calcification' will long be heard."[7]

Articles are appearing more and more frequently discussing the changes brought about in bone as a result of deficiency in vitamin C. The following statements are taken from a recent review by McIntosh on the relation of vitamin C to bone problems: "Scurvy interferes with the mechanism for removal of calcified cartilage matrix; it suppresses the formation of new trabeculae; and wherever there is bone already formed resorption proceeds. These changes morphologically important in themselves affect the structure of bone also from a functional point of view by diminishing its capacity to withstand mechanical stress."[8] Details of the pathology of scurvy would be out of place in this paper, but the question could be asked: How large a part does a low vitamin C diet play in the problems of the orthodontist?

For nearly three years at the University of California College of Dentistry dietary studies have been made on all children accepted for orthodontic treatment in addition to a physical examination and laboratory tests.

What has been the nutrition setup of these children? Please notice I do not say dietary setup. Nutrition setup is a phrase I have adopted which includes more than the food a person has eaten. It attempts to portray the general health, the home setup, as well as the nutrition of an individual.

Of the first 80 children I have listed from the nutrition setup standpoint 3, or 3.75 per cent, as VERY POOR RISKS; 19, or 23.75 per cent, as POOR RISKS; 41, or 51.25 per cent, as FAIR RISKS; and 17, or 21.25 per cent, as GOOD RISKS. Let me hasten to say that these children were excellent teaching cases. While working under guidance the students would probably meet nearly every problem that they would ever meet in practice except the nutritional one.

The following case is cited to illustrate what I mean by a POOR RISK. Jack (which is not his name) was nearly fifteen years of age when he was accepted for orthodontic treatment. He was the sixth child of very poor parents; and pregnancies had been close together. He was adopted into his present home when he was about nine months of age. Since his adoption everything possible has been done for him from dental and medical standpoints. He attended special "sunshine schools" when younger, where rest and diet were supervised. But he was "the never hungry child," and his food consumption appeared to be considerably below that which would be considered optimum for a growing boy. He has had a long record of illnesses including several attacks of pneumonia. After

Jack's dietary history was taken and suggestions were made which increased all his dietary factors to what would be considered optimum, cooperation by the foster mother has been very good, generally speaking. She serves the kinds of foods suggested and purchases commercial products for increasing vitamins A and D; but Jack has been negligent (which he frankly admits) about taking the vitamins A and D capsules. "He forgets," he says, even though asked to keep them near his toothbrush so that he does not have to remember to take them. He does not appear to have a sufficient amount of that intangible something to cause him to assume the responsibility of good cooperation.

However, the foster mother assures me that the changes we made in his diet have benefited him as shown by an increased appetite and by his general appearance. In twenty-two months he has gained 18 pounds and has grown nearly 3 inches, which may have had nothing to do with the change in his diet. He has had several illnesses since the orthodontic work was started. From a study of his history it would appear that his hereditary potential for health is low. It is too soon to know what the final outcome of his case will be, but he probably is a better risk now than if no dietary suggestions had been made.

Sixty-six of the 80 children could not be considered good orthodontic risks from a nutrition standpoint. The remaining 17 could be considered good risks because of their favorable nutrition setup which includes good food habits, good health habits, and in many instances a good health record. However, I fully recognize that they could be orthodontic failures due to one or more factors mentioned by McCoy. But I am speaking of the orthodontic risk from the nutrition setup standpoint. If one of these 17 children were an orthodontic failure, factors other than nutrition could be said to be playing the dominant rôle; whereas if any number of the 66 children mentioned as very poor, poor, or fair risks were failures, one could raise the question as to whether an unsatisfactory nutrition setup (in addition to possible rapid growth) had been in part responsible for the unsatisfactory outcome.

What bearing does this discussion have on the problems of the orthodontist? Before suggesting a possible answer let us consider a symposium on "Orthodontic Failures" conducted by three leading men in the field which appeared in a recent number of the INTERNATIONAL JOURNAL OF ORTHODONTIA AND ORAL SURGERY.[9]

One of the questions raised in the symposium was "What is the definition of failure or success?" To quote from one of the papers: "The goal is normal occlusion. We aspire to normal occlusion except in those cases in which variations from the normal structure make the achievement of anything beyond good function impossible. In such cases the only failure is on the part of nature in not balancing the amount of tooth material, the length of muscles or some other important factor. In summation, I would say that while many failures are directly attributable to errors in treatment, there are others which appear destined to failure under any kind of treatment or without any treatment. Certain steps because of their compatibility with the developmental processes in growth are more likely to lead to success. Other procedures because they run counter to natural development are more likely to lead to failure."

In his part of the symposium, Hellman groups failures under the following six general captions:

1. Failures due to lack of appraisal or developmental progress.
2. Failures due to neglect of distinguishing between favorable and unfavorable trends in the development of dentition.
3. Failures due to improper decisions of the actual need for orthodontic treatment in borderline cases.
4. Failures due to inappropriate timing of the introduction of the mechanical procedure, when the teeth are definitely in malocclusion and treatment is indicated.
5. Failures due to inability to carry out successfully the measures employed.
6. Failures due to unfavorable changes which follow successfully treated cases.

A question could be asked which would seem to be of importance but which was not raised in this symposium: What relation, if any, does rapid growth during the period of orthodontic treatment or just following it in addition to a poor or fair nutrition setup have to do with failures?

I do not know anything about orthodontic procedures, so I am in no position even to comment upon the above citations or upon other problems discussed in the symposium. However, as I studied these three papers, which you will all probably admit comprise the best thought extant upon the causes of failures in orthodontic practice, I was struck with the absence of any mention of the possibility of unsatisfactory nutrition being a factor in part at least responsible for failures. The three men discussed failures in treatment as if all the responsibility for success (or failure) should rest with the orthodontist. Granted, the orthodontist has his share of responsibility. But, on the other hand, what factors are involved in the growth of new bone? Is not the growth of new bone a factor in bringing an orthodontic case to a successful close?

Although all dietary factors are unquestionably needed for building new bone, vitamins C and D and phosphorus and calcium are probably needed in largest amounts. Were these dietary essentials available in sufficient amounts to build *normal* bone about the teeth as well as to take care of the growth of the child? In other words, when discussing orthodontic failures, should not the question at times be asked: From the nutrition standpoint were the patients in the last analysis ever good orthodontic risks? Time does not permit a discussion of the experimental work by H. C. Sherman and his coworkers on calcium and phosphorus intake in animals and the resulting ash content of their skeletons.[10]

Please do not think that I am attempting to present material which I want to be interpreted as suggesting that nutrition is the only factor to be considered in orthodontics. Such an attitude would be not only extremely unscientific but also ridiculous. The hereditary potential is probably one of the most powerful forces which the orthodontist must circumvent if he can. The purpose of my paper is to present to you the point of view that, if you knew the nutrition setup of a child, you would have a better understanding as to whether the child may or may not be a good risk.

Possibly some of you are thinking, How are we going to tell whether a child is a good risk from the nutrition standpoint? The details of taking a dietary history would be out of place here, but a general outline will be given. The first step is to secure the health record. In other words, has the child had a long record of illnesses which in turn would interfere not only with his appetite but also probably with the assimilation of food? The health of the mother during pregnancy may or may not be a factor of importance. Apparently more research is needed on this point.

The next step to consider is, What have been the food habits of the child? Has he or she always had a good appetite or is the child one of those finicky children? Does an atmosphere of "pathologic solicitude" surround the child and his food? A two to three weeks' record of all foods eaten by the child (which should include candy and all extra foods) is an indispensable part of the nutrition history. These menus give you the present food setup with which you have to work; the record may or may not be an index of earlier food habits. What is to be learned by studying the menus submitted? For example, during the entire period you find no eggs served as eggs and very few foods served containing them; no cheese; meat not more than two to three times during the entire two weeks' period; not more than a glass of milk a day; fresh fruit or raw vegetables only a few times, and no tomatoes (fresh or canned) and no tomato juice. However, you do find considerable bread, jelly, jams, pastry, cookies, candy, coffee, coffee cake, doughnuts, snails, cooked vegetables and stewed fruit.

From such a food setup could the intake of calcium, phosphorus, protein and vitamins be considered adequate for building normal bone? The answer is unquestionably No. Does the child have considerable tooth decay? What relation has sweet food to the total food intake? How many hours a day (or week) does the child spend in the sunshine? Has cod liver oil or other source of vitamin D (and A) been given?

If the above food setup represents the general food habits of a child of twelve years of age for the past five to six years, considerable reeducation of the parents and the child on the matter of diet is necessary. With the present knowledge of nutrition it would probably be only a rather spoiled child who was taking so inadequate a diet, but we do have a few such cases in our records. Low food intake among adolescent girls may be another problem with which the orthodontist has to contend. Their diet may be adequate in character but inadequate in amount.

Before giving a synopsis of dietary requirements it should be stated that there is no one food indispensable in nutrition. The dietary elements which a certain food contains may be indispensable, but all dietary factors may be secured in a number of ways, as human experience has shown. In our diet milk and cheese are our calcium rich foods, but this is not true of other systems of diet. In other words, there is no one system of diet which must serve all members of the human race. The diet of the Eskimo is very different from the diet of the South Sea Islander; both in turn differ from our diet, but we all

continue to thrive and to enjoy at least a fair degree of health. But in our system of diet when a child or adult does not include milk or cheese or foods made from them, he is rarely if ever securing calcium from foods which supply this element to the Eskimo or to the South Sea Islander; hence the calcium content of his diet is below that believed necessary for optimum well-being. Milk may be taken in any of its various forms or used in cooking; it does not have to be taken as a beverage.

Meats, eggs, cheese, milk, peas, beans and nuts are all protein and phosphorus foods. Many foods add small amounts of protein and phosphorus to the diet, such as bread, cereals, fruits and vegetables, but they are not considered protein-phosphorus rich foods.

From a practical standpoint, if a child's diet is built around the following foods, the various dietary essentials will be present. Total calories should be increased according to need. I would suggest increasing calories by raising fats, such as butter, salad dressings, gravies and the foods which go with them, rather than increasing the sweet foods. When a person's likes and dislikes and food habits are known, it is usually not difficult to adjust his diet so that it contains liberal amounts of all dietary factors. The more closely the suggested diet simulates present food habits, the more likely is an individual to adhere to it. Man has been defined as a bundle of habits; in some measure this also applies to the child.

3 (8 oz.) glasses of milk (in addition to that used on cereals and in cooking).

1 (8 oz.) glass of orange juice or tomato juice (undiluted); however, if other fruits and vegetables such as apples, bananas, grapefruit, lemons, pineapple (fresh or canned); or lettuce, tomatoes (fresh or canned), cabbage, carrots, etc., are available and are used, it is not necessary to buy oranges or tomato juice.

1 to 2 eggs (depending upon the amount of other protein foods served).

1 to 2 servings of meat, fish, cottage cheese, other cheeses, beans, peas or nuts.

1 serving of whole grain cereal at least 4 times a week for those who like it. For those who do not, but need more vitamin B, whole grain breads, wheat germ, yeast tablets or other sources of vitamin B are available.

2 servings or more of vegetables in addition to potatoes; preferably green and yellow ones. Fruits, which are generally more expensive, may be substituted, by and large, for them. That is, if a child likes fruits better than some vegetables and cost is not the first consideration, let fruits in part be substituted for vegetables.

1 to 2 teaspoonfuls of high potency cod liver oil or its equivalent in vitamin D; this also supplies vitamin A. There are also on the market mixtures of fish oils which may replace cod liver oil; only a few drops daily are necessary. There are also numerous kinds of capsules and tablets on the market which may be taken in place of the oil; the cost is usually a little higher.

The above outline may be expressed in a day's menu such as the following:

Breakfast:

one-half grapefruit
whole grain cereal plus thin cream
1 egg with or without bacon
whole grain toast, butter
1 glass milk or cocoa

Lunch:

cream of tomato soup, crackers
pineapple, cottage cheese salad
whole grain bread, butter
chocolate pudding, cream
1 glass of milk

Dinner:

meat balls (beef plus small amount of inexpensive liver)
mashed potatoes
buttered carrots
cole slaw
whole grain bread, butter
applesauce, plain cake
1 glass milk

In addition, extra vitamins A and D in one of the many forms on the market. If a child is so situated that he is exposed to the sunshine for three to four hours in midday or if his diet contains considerable fish such as salmon, tuna, sardines or herring, additional vitamin D may not be necessary. Vitamin A can easily be increased by these fish, and also by the use of various greens such as escarole, spinach, etc., but any green and yellow vegetables add considerable of this factor.

The above menu is only a suggestion. It is not practicable to suggest a series of menus to be followed because the time available for the preparation of meals and the money available for food are two factors which in part determine the type of meals served. Although the above menu is not an elaborate one, even simpler meals are entirely satisfactory provided the dietary essentials are present.

In fact, simple meals not infrequently are of higher nutritive value than more elaborate ones because the latter are often composed in great measure of highly refined foods and fats, foods which are palatable but which are often low in minerals, in vitamins and in proteins.

The question is frequently asked whether a dentist should inquire into the food habits of a child if the child is under the care of a pediatrician. This question suggests a second one: How many children under the care of orthodontists are also under the care of pediatricians? After a child is accepted for orthodontic treatment, undoubtedly the orthodontist sees him (or her) more frequently than the pediatrician does. Are not the fundamentals of nutrition and the details of child feeding the same regardless of whether a pediatrician or a dentist (in this case the orthodontist) is teaching them? Even if a child is under the care of a pediatrician, is there any reason why the dentist should not inquire whether or not the foods suggested are being taken regularly? Is not

the end-result, namely, a highly satisfactory diet, not only suggested but taken, which in turn may (or may not) mean a *good* or a *poor* orthodontic risk, the goal?

I recognize that to discuss dietary problems with patients presupposes an understanding of the fundamentals of nutrition; but a working knowledge of this subject is not difficult to secure. A discussion of food values cannot be given here, but I would like to call attention to an excellent book by Bogert entitled *Nutrition and Physical Fitness.* This book is not technical and contains a wealth of information.[11]

In closing, I want to say that I am fully aware that many factors complicate the work of the orthodontist. However, if he could be assured that all his patients had had in the past and were now taking a highly satisfactory diet, he would have one less variable to consider in his work. As our work progresses I am beginning to wonder whether faulty nutrition, except as it plays a rôle in rickets and malnutrition which in turn may (or may not) intensify an inherited potential toward malocclusion, has so important a rôle in the causation of orthodontic problems, as a highly satisfactory nutrition prior to, during and after treatment may play in bringing a case to a successful close.

Becks has ably discussed the problem of root-end resorption and its possible relation to endocrine disturbances.[12] However, may I raise the question whether malnutrition, which has been defined as the great disease of the American school child, is also playing its rôle in some cases of root-end resorption? Malnutrition and rapid growth cannot help but be a poor combination for any orthodontist. Further research will, we hope, throw more light upon this and other confusing problems.

REFERENCES

1. McCoy, J. D.: Applied Orthodontics, Philadelphia, 1935, Lea & Febiger.
2. Hogeboom, F. E.: Is Teen-Age Caries an Endocrine Problem? J. A. D. A. **24**: 422, 1937 (consult bibliography).
3. Marinus, C. J.: Observations Regarding the Dental Development of Children With Endocrine Disturbances, Dental Record **54**: 31, 1934. (Quoted from Millberry, G. S.: The Teeth. Practice of Pediatrics, edited by J. Brenneman, M.D., Vol. III, Chap. 3.)
4. Guyer, M. F.: Heredity and the Constitution of the Child, Am. J. Dis. Child. **45**: 601, 1933.
5. Dick, J. L.: Rickets. A Study of Economic Conditions and Their Effect on the Health of the Nation, New York, 1922.
6. Sherman, H. C., and Pappenheimer, A. M.: A Dietetic Production of Rickets in Rats and Its Prevention by an Inorganic Salt, Proc. Soc. Exper. Biol. & Med. **18**: 193, 1921.
   Shipley, P. G., Park, E. A., McCollum, E. V., and Simmonds, N.: A Pathological Condition Bearing Fundamental Resemblances to Rickets of the Human Being Resulting From Diets Low in Phosphorus and Fat-Soluble A.: The Phosphate Ion in Its Prevention, Johns Hopkins Hosp. Bull. **32**: 159, 1921.
7. Gamble, J.: Chemistry in Medicine, page 157, New York, 1928.
8. McIntosh, R.: Infantile Scurvy, Practice of Pediatrics, Edited by J. Brenneman, M.D., Vol. I, Chap. 35.
9. Rogers, A. P.: Orthodontic Failures, INT. J. ORTHO. **22**: 335, 1936.
   Mershon, J. V.: Failures, Ibid. **22**: 338, 1936.
   Hellman, M.: Failures in Orthodontic Practice, Ibid. **22**: 343, 1936.
10. Sherman, H. C., and Booher, L.: The Calcium Content of the Body in Relation to That of the Food, J. Biol. Chem. **93**: 93, 1931.
11. Bogert, L. J.: Nutrition and Physical Fitness, Philadelphia, 1935.
12. Becks, H.: Root Resorptions and Their Relation to Pathologic Bone Formation, INT. J. ORTHO. **22**: 445, 1936.

DISCUSSION

Dr. Earl F. Lussier.—It would be presumptive on my part to attempt to discuss a paper by such an authority on a question of such magnitude and on a subject beyond my scope. May my part be more of an effort to stress the special problems of diet that are met with in orthodontics. In this humble manner I shall begin.

The development and the health of the teeth and jaws during childhood are dependent more upon these two factors, nutrition and function, than upon any other.

Dr. Simmonds has stressed the points that an abundance of the right food is necessary and that probably no single factor is so largely to blame for dental diseases as is faulty diet. It is of little value to know that we need proteins, carbohydrates, mineral salts and vitamins, unless this knowledge is applied to the daily choice of foods.

In considering the relation of foods to good teeth the appetite is not a safe guide in the choice of what to eat. One only needs to practice orthodontics a short time to know that the average orthodontic patient has a taste for foods which do not contribute to good teeth. Nothing is more easily acquired or harder to break than an abnormal appetite for sweets. Too much sugar not only is injurious in itself but it spoils the desire for body-building foods. For this reason and for the further reason that sweets appear in many instances to contribute to decay, a very potent factor in orthodontics, which may interfere with the position of orthodontic appliances, I have made a strict rule of no candy during active orthodontic treatment. This procedure has resulted in a great reduction of the incidence of decay during treatment over the amount of decay at the beginning of or before treatment. I am instituting, this year, a plan to check more accurately the incidence of decay during treatment. A postcard is enclosed in the notice sent to the dentist at the time of periodic dental visits, which is filled out by the dentist and returned to me and kept in the patient's file.

I am not qualified to state how much of this reduction of decay is due to the strict rule of no candy; although this theory has its support in an interesting experiment conducted by the dental profession in a number of orphanages in Michigan. The most striking results of this experiment were that in the groups having the greatest amount of sweets in their diet, tooth decay was most prevalent, while with those groups eating the smallest amount of sweets, tooth decay was largely absent.

Probably the factor of most importance to the orthodontist is that of function. It not only is necessary that one have an abundance of those foods which make good teeth but also is important to have a normal functioning denture by which vigorous chewing may be had.

It is this point that the orthodontist must be cognizant of in his study of diet, for rarely does he meet a normally functioning denture. His work is with crippled mouths that interfere with one of the most important factors in diet, that of mastication. Thus it is seen that our efforts must be directed in an attempt to propagate the recognition of the early beginnings of dental deformities and the correction of them, for the failure to use the deciduous teeth not only causes an insufficient growth of the jaws but may interfere with normal intake of food.

A knowledge of the foods that make for growth and development is only part of his study. He must often supplement the diet and also find means of supplying these foods in a digestible form until the deformity has been corrected. His patients are the finicky appetite patients, so-called, but in truth they are merely prevented from a normal and pleasurable act by the deformity. In the discussion of the problem of finicky appetites with a physician, who claims that as much as seven hours' time is given to a study of these cases, I showed him a case of no occlusion of the teeth. This is a complete lingual version case. I asked him what part the function of teeth played in the rôle of finicky appetites. This was a new thought and impressed him very much. I met him two weeks later and he expressed the wish that he had an orthodontist at his side constantly as he saw so much of this thing.

This brings to mind another problem. If the physician spends hours in the study of the diet of his patients we cannot expect to be aided much by this subject unless we are willing to devote time to our studies. This procedure certainly would mean the necessity of edu-

cating the public to the value of an orthodontic diagnosis, for up to now the average orthodontic diagnosis has had no money value placed upon it with the exception, of course, of the roentgenographic part which is usually charged for by the x-ray technician.

Dr. Simmonds.—Dr. Lussier has mentioned a very important point, namely, a child may be undernourished even though living in the midst of an abundance of food because he is unable to chew food due to the way in which it is served.

One of our most palatable foods is meat. Meat is an excellent source of protein (also of phosphorus and of iron) but not an indispensable source of any of these factors. However, if a child is unable to eat a slice of roast beef or chop (or other meat) because he is unable to masticate it, this meat is not serving as a source of protein (or phosphorus or iron) for this child. If the meat is served as ground meat, such as meat balls or meat loaf or cut into very small pieces, the child is able to swallow it without additional chewing.

Eggs in the many ways in which they may be served enter into the diet (soft boiled, poached, scrambled or in custards), and cheese dishes, including cottage cheese, and creamed soups especially if enriched with a protein food such as puréed beans or peas of various kinds are excellent sources of protein.

Another important point brought by Dr. Lussier is that a child may be considered a finicky eater when in reality his food consumption is low due to his inability to masticate many foods.

Because protein rich foods are also phosphorus and iron rich foods, when a child eats little or no meat and meat is not replaced by other protein foods, not only may a child be taking a diet below his protein and iron requirement (among other things) but also the diet is undoubtedly below his phosphorus requirement. Phosphorus is required in liberal amounts for the production of normal bone.

In conclusion, it should be stressed that it is important to see not only that a child has a highly satisfactory diet but also that the foods are served in a form which he may eat in comfort.

THE STRUCTURAL-FUNCTIONAL ELEMENTS OF NORMAL OCCLUSION

GEORGE H. MAXWELL, D.D.S., CHICAGO, ILL.

WHEN I received an invitation to appear on this program I was not only surprised but pleased. In the first place, since I am a general practitioner I most certainly would have to be overly impressed with a sense of my own importance if I did not recognize the honor of being invited to give a paper on the subject of occlusion before this Society.

In the second place, about four years ago I formulated a theory or working hypothesis which purports to define accurately the structural-functional elements of a normal occlusion. This hypothesis has met with theoretical approval in certain restricted circles, and the results of practical applications, to date, have been more satisfactory than those attained prior to its adoption as an operative basis. Both of these circumstances are gratifying, but by no stretch of the imagination or reason can any decision yet rendered be considered to be conclusive.

I sincerely believe that this conception of occlusion has a factual foundation in nature, that it meets the requirements of universal application and natural variation, that it has a practical value in all comprehensive dental procedures, and that its greatest practical value, from the standpoint of the ultimate conservation of teeth, lies in the field of orthodontia.

I realize that you gentlemen, as members of a scientific society, are interested more in truth than in personal opinion. Psychology teaches us that a personal opinion is made up of an emotional factor and an intellectual factor. I hold a belief that there is no such thing as an unprejudiced opinion, and that almost without exception we fail consciously to connect our emotions and opinions. In any case, the connection between the emotion and the resulting opinion is never apparent to the holder of the prejudice by virtue of the fact that it is the essential nature of a prejudice that the connection is not apparent. A prejudiced person therefore believes that he holds his opinions on purely logical grounds.

Believing these things as I do, I was pleased to have the opportunity to submit this conception to this Society, which, in my mind, is the world's best qualified judge as to its merit or lack of merit.

Since time will not permit a comprehensive presentation of the many factors involved, I have chosen to present the basic features from a purely mechanistic viewpoint, regardless of the fact that I believe factual evidence of a biologic nature, aside from being more interesting, possibly offers more

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in support of the claims than factual evidence associated with kinematic principles, although I am sure that we will agree that these principles are more definitely established than those which purport to explain life.

One of the members of this Society, a gentleman whom I greatly admire, once said to me that orthodontia is an art and not a science. Art is defined as a system of rules for procuring some scientific, esthetic, or practical result. A scientific result depends upon the application of knowledge, knowledge in which the results of investigation have been systematized. Progress in any endeavor depends upon a working hypothesis, which thought implies systematization. Progress in the material world is outstanding, deserves the designation scientific, and is directly traceable to an operative basis founded in idealized concepts. As an example, to a physicist the lever is a pure abstraction, and all established principles in connection therewith are formulated by scientific study that deals with the motions, in time and space, of idealized, insubstantial, massless, geometrical points, or configurations of points. All principles of mechanics fall in the same abstract category.

Progress in the material world is associated largely with inert matter. Dental endeavor is largely concerned with living things. Living things are physicochemical machines of extraordinary complexity, amenable to and activated by physical laws.

Practical orthodontic endeavor must necessarily forever remain an art, but its objective and expected results become scientific as knowledge of all factors concerned increases. A factual knowledge concerning the structural-functional elements of a normal occlusion should make the objective definite and the results more scientific. An understanding of the idealized concepts of the physicist by which the laws of mechanics are formulated is one of the prerequisites of a definite mechanistic objective. The knowledge of the application of these principles as they obtain in a normal occlusion is the second requirement for a comprehension of a definite structural-functional objective.

I sincerely believe that a point has been reached in investigation and experimentation where such knowledge has been determined and systematized. Natural variation consigns such systematization to the realm of the abstract, hence the conception, an ideal occlusion.

My purpose today is to demonstrate the correlation of certain well-established physical principles with the structural and functional elements of human dentition, as these applied principles and structural and functional values are found in those examples which analytical observation and experimental evidence have decreed to be nature's standard of excellence.

It is a primary observation that the relative percentage of par excellent examples in brute dentition greatly exceeds that found in human dentitions. This observation is particularly impressive where so-called civilization has reached its highest level. Wide observation clearly indicates that the environment of civilization tends toward a deleterious change not only in denture morphology but also in tooth morphology, which change is incompatible with functional harmony and efficiency with the resultant tendency toward partial or complete early destruction of the dentition. The purpose of civilization,

if any, is the progress of man, which end is necessarily dependent upon science. Possibly man formerly was constitutionally fitter to survive. Today he must be mentally fitter if teeth are to survive throughout the normal span of life.

Biologic science has long since demonstrated that structure and function are inalterably linked. As progress is made in the study of the correlated morphology and physiology of opposing human dentures, the intimacy of certain structural and functional relationships becomes more and more pronounced, especially when a knowledge is acquired that certain relationships, both separate and coordinate, are spherical in nature, and in certain specific instances are actually spherically identical.

These structural and functional elements will be presented as a pure abstraction with a mathematical basis, and will be collectively designated as the ideal occlusion of an ideal denture morphology. This conception of an ideal occlusion is based upon the conception that living things, whether complete or component, are simply physicochemical machines. It is offered as a mechanistic objective for orthodontic endeavor wherein the occlusal stresses of functional activity constitute the primary environmental factor of a stabilized arrangement of the component units of the two dentures capable of rendering the highest possible degree of functional efficiency.

The term ideal occlusion, by virtue of the qualifying adjective, implies certain abstract qualitative functional factors, and therefore the term can be applied only where certain abstract qualitative factors of denture morphology are assumed to be present and as perfect as human imagination will permit.

An ideal masticating machine presupposes resident qualitative functional and structural factors capable of collectively rendering the highest possible degree of functional efficiency in the incision and trituration of food, a collective occluding and non-occluding activity.

Analytical observation of normal dentition has established the premise that such mechanical efficiency can be attained only where each and every individual tooth unit of the maxillary and mandibular dentures makes continuous occluding contact with at least one, and no more than two, opposing units throughout each and every functional occluding range of denture relationship—a statement which from a factual standpoint requires a bilateral functional interpretation.

A machine which harmoniously fulfills these functional requirements and which consists of eighty-two interdigitating and approximating anatomical cusps necessarily must have a very definite structural character as well as one which lies in the field of complexity.

Enamel tissue is the only tissue which actually participates in the function—occlusion. Enamel tissue belongs in a realm of physical existence of dubious character from the standpoint of the living and nonliving. Taking the physical, morphologic, and physiologic characters of enamel into consideration, we are led to believe that from the standpoint of the application of physical principles, a purely mechanistic development or conception of occlusion is not untenable. Therefore the structural and functional elements will be presented as separately as possible, the structural phase of the discus-

sion dealing with the morphology of a three dimensional system of enamel entities. The treatment of the functional element will naturally introduce the additional element of time, thus elaborating upon the instantaneous relationships of the relatively fixed and moving portions of this system of enamel bodies, a comparatively simple study in kinematics when the dimensional elements of the morphology are clearly understood.

An ideal occlusion presupposes the abstract reality of a system of thirty-two enamel units of idealized anatomic contour, each half of the numerical strength of this system comprising an opposing denture. Such concrete reality as the sequence of eruption and occlusion of the individual component enamel units of the dentures is entirely extraneous from the standpoint of either ideal denture morphology or ideal functional relationships of the dentures. Such a consideration as arch form, from an occlusal perspective, that is, the width of the dental arch, is not extraneous. In other words, the ideal contemplates a system of full numerical strength and is not directly concerned in the evolution of the system. The above-mentioned extraneous factual considerations deserve special attention which time prohibits today. The ideal dentures of an ideal occlusion must necessarily meet the three dimensional requirements of the par excellent examples of natural facts and natural variation.

In further support of a purely mechanistic conception of occlusion, I wish to state that from a completely restricted standpoint of occlusion, natural dentition is composed only of enamel units, which, as already mentioned, can be considered by no great stretch of the imagination to be nonliving tissue, supported and activated into functional being by living tissues; in other words, the two opposing enamel dentures, fastened as they are to the external surface of the human body, constitute a nonliving machine, in exactly the same mechanistic sense that the nonliving portions of the finger nails are simply handy mechanical adjuncts of the human body.

The well-established principle that there is no such thing as stasis in nature undoubtedly applies to natural dentition—a fact that the dental practitioner should continually bear in mind—but no such factor can be allowed to apply to this contemplated ideal.

Neither can the established principle of Le Chatelier be allowed to participate in the picture. This principle stipulates that when a factor which tends to destroy an equilibrium is introduced, a reaction occurs which tends to destroy the factor. Observation confirms a belief that this principle is in continuous operation in both normally and abnormally arranged dentitions, but the proposed abstraction of an ideal occlusion contemplates a perfectly stable equilibrium.

Normal denture functional activity is actualized by the fixation of one denture and the motion of the other denture, accompanied by occlusal stress, which state of being introduces individual movement of the component tooth units, a qualitative factor of normal dentition entirely foreign to the contemplated ideal.

This ideal contemplates perfectly coordinated mesiodistal dimensions and a collective proximal contact of component units, a factual circumstance of dubious character in the large percentage of cases of natural dentition, the lack of appreciation of which largely accounts for the apparent fact that man-made ideas of esthetics have often been allowed to supercede harmonious functional considerations in present-day regulatory procedures. The resident esthetic values of this ideal are decidedly nonessentials. They are a natural corollary by virtue of the bilateral symmetry associated with sphericity and the mirror-image relationships of bilateral equivalents. The morphologic, physiologic, and esthetic values embody a definite number of constants and permit a multiplicity of variables. The constants are configurations of points in space by which the structure of the two dentures and the multitudinous instantaneous denture relationships of functional activity can be described.

The structural description of a three dimensional object, such as a cusp or a denture, involves relative mensuration in the three spacial dimensions. A description of the collective relationships found in each denture in each and every individual instance of malocclusion requires two specific collective structural descriptions which are inapplicable to any other malocclusion, and these descriptions are without value unless a structural standard exists as a basis of comparison.

The separate respective dentures concerned in all normal occlusions have common structural and functional characters as well as individual characters. The scheme of the ideal is simple yet so comprehensive that it includes all the common structural and functional characters of all normal occlusions, yet in no way interferes with the presence of the individual characters.

The marvelous descriptions of the interdependent anatomic relationships of normal occlusion found in present-day textbooks on orthodontia are confined almost exclusively to those which obtain at centric relationship, a common denture relationship of all functional ranges where motion is not involved. Functional activity involves motion, and centric relationship is of no more importance than each and every one of the innumerable instantaneous denture relationships where motion is involved.

A description of these innumerable anatomic relationships reaches into a field of complexity in which the human mind refuses to function. A description of the anatomic relationships of a normal centric occlusion or a description of those relationships as they obtain in any one or all of the innumerable relationships of function does not give the slightest inkling as to the separate relative structural values of the component tooth units or their spacial relationships in either a malocclusion or a normal occlusion. Hence interdependent anatomic relationship cannot serve as a dependable operative guide where an attempt is being made to correlate these separate structural values into two separate structural entities which maintain continuous occluding contact during function and at the same time present a collective structural relationship which is in consonance with the differentials of not only two dimensional motion but also three dimensional motions of a single

point, or a configuration of points, in space, regardless of whether the center of motion is fixed or moving. By no possible stretch of the imagination can these statements be construed to imply that I contend that a knowledge of interdependent anatomic relationships or the anatomic relationships themselves are without value. Normal anatomic relationships are a resultant of correlated individual structural values arranged in such manner that each structural unit bears a definite relationship to each and every other structural unit of both dentures.

Since a definite arrangement of correlated structural values is mechanistically imperative, since certain elements of sphericity are concerned in both the idealized and the normal structural-functional combination, since function introduces the fourth dimensional element—time—and since a perfect equilibrium is in contemplation, the student of normal dentition will make greater progress if he will adopt a purely mechanistic viewpoint. A mechanistic study naturally involves the principles of statistics and kinematics by which the laws of mechanics are formulated. Practical progress, with this ideal as an objective, depends upon a knowledge of these principles.

One of the very old primary observations concerning denture morphology is the association of curvature with the arrangement of the component tooth units. Since the time of the original observation, which I believe is the curve of Spee, many different premises relating to denture morphology having a common agreement of curvature association have been advanced. Most of these premises have failed to withstand the test of time and experimental scrutiny. Analytical investigation of the survivors reveals in some instances a complete absence of definite anatomic landmarks of application of the curvatures suggested, and in others a pronounced lack of clarity of application to an extent whereby no single premise, or any combination of accepted premises, can be used as a completely satisfactory working hypothesis, with the general result that if such an attempt is made, confusion, if not utter chaos, is evidenced. Even where confusion is conspicuous by its apparent absence in highly skilled hands, the basis of the relative success is widely experimental in its nature and not fundamentally scientific.

Most of these conceptions relate primarily to denture morphology. One makes a more or less meritorious attempt to correlate structure and function but fails to offer a logical explanation. All the survivors of these diverse conceptions contain elements of truth as well as palpable errors, the latter being founded in a lack of definiteness and coordination.

All these conceptions have recognized yet have failed to define specifically an element of concavity associated with the mandibular denture and an element of convexity associated with the maxillary denture, a feasible provision for a machine which consists of a moving part in contact with a fixed part. Dr. George Monson made a very confused attempt to explain the structural-functional combination by formulating a theory known as the spherical principle; but as a lucid explanation and working hypothesis, it proved to be very unsatisfactory—a result not unexpected, if factual considerations, well-established kinematic principles, and other physical laws are completely disregarded.

Regardless of the fact that his theory was erroneous, taken as a whole in both its theoretical and practical details of application, it was basically sound, yet at the same time technically incorrect.

A machine consisting of two parts, one of which moves and has a concave spherical surface in contact with the convex spherical surface of the fixed part, is a structural-functional simplicity. We have such a machine here. (Fig. 1*A*.)

A machine consisting of a moving part with a contacting surface which embodies a structural element of concavity and remains in contact with the surface of the fixed part, which surface embodies the element of convexity, the two surfaces consisting of a collection of cusp eminences such as the two dentures present, cannot be classified otherwise than as a structural-functional complexity. We have here such a machine. (Fig. 1*B*.)

These two machines embody identical principles, although the two separate applications are entirely different.

A knowledge of the exact nature of the curvatures involved in this second machine is the key to the structural-functional complexity which per-

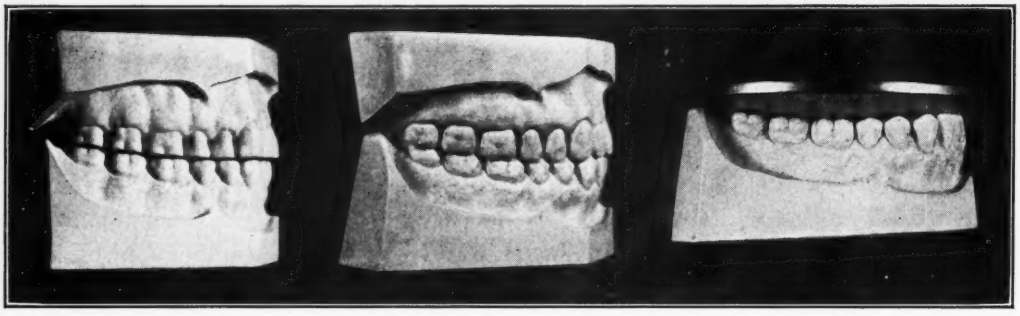

Fig. 1*A*. Fig. 1*B*. Fig. 1*C*.

mits continuous occluding contact of thirty-two component units during the two dimensional motion, and eighteen units (sixteen on one side and two on the other) during each of the two three-dimensional ranges of motion. In other words, the key to the complexity is the answer to the question, "What is the exact nature of the curvature involved in such a structural-functional entity?"

It is perfectly evident that the complexity is due to the presence of the cusps, and the answer concerning the character of the curvature must necessarily correlate with the unilateral and bilateral functional nature and the bilaterally equivalent structural nature of these actively participating parts, exclusive of the supporting and energizing adjuncts, regardless of any correlation demanded on their part.

The geometrical principles of kinematics definitely indicate the character of the one curvature which fulfills the requirements, namely, regular curvature associated with a fixed center, the three spacial dimensions, and the element of time—this latter, owing to the presence of the elements of fixation and motion. The surface of a sphere is the only kind of curvature which can

possibly fulfill the structural-functional requirements owing to the presence of the element of continuous occluding contact. It is therefore perfectly obvious that the common element of the structural-functional combination is spherical in its nature.

The question involved is therefore reduced to one of specific application of this curvature, and it is perfectly evident that the secret of the application is concealed in those portions of the enamel bodies which make occluding contact, namely, the cusps.

A superficial examination of both the fixed and the mobile enamel dentures reveals that each is composed of individual enamel units, which can readily be classified into four distinct morphologic subdivisions, with the resultant well-known dental formula. The common characters of the two dentures, such as numerical tooth strength and morphologic-physiologic gradients, as represented in number and relative location of cusp contours and incising edges, are very obvious, but diligent search reveals purely individualistic denture characters associated with these physiologic gradients.

A short review of the more obvious differences in the physiologic gradients is necessary to lay the foundation for the development of the structural elements of an ideal denture morphology as well as to show the initial steps in logical selection of definite landmarks of geometrical application of the curvatures involved.

Observation of normal functional activity permits the classification of the physiologic gradients as represented by cusp contours into: (1) those which universally participate in the continuous occluding contact of opponents during the functional range, (2) those which sometimes do and sometimes do not so participate, according to the individual instances selected, and (3) those which never participate in this function during the functional range.

Those gradients of a functionally constant character are designated as major cusps. All others are designated as minor cusps. It is logical to assume that the curvatures concerned in the structure of normal dentition are associated with the major cusps by virtue of their constant functional characteristics.

Painstaking analysis and correlation of the many factors involved in the structural and functional elements of normal dentition reveal that the major cusps of the mandibular denture have a definite structural character as to relative height, width, and depth of a constantly variable nature, which character is also present but not so obvious in all the major cusps of the maxillary denture.

The relative dimensional values of major cusps are a natural evolutionary adaptation structurally and functionally correlated in consonance with the differentials of motion, in time and space, of a configuration of points associated with the ideal arrangement of the component tooth units of the mandibular denture.

To demonstrate in detail the relative dimensional values of major cusps is a very involved task. However, as the tooth and denture relationships

involved in an ideal occlusion are revealed, one of the structural elements of dentition, namely, relative cusp height, becomes perfectly obvious.

The schematic drawings which will be used to illustrate the individual and collective relationships of an ideal occlusion introduce inaccuracies from the standpoint of perspective; therefore a photograph (Fig. 1*C*) showing a spherical template resting upon the model of the mandibular denture is offered to assist in clarifying the conception of the spherical relationships which the drawings are intended to represent. Please note that there is a hole in the template. I wish to state that the template rests on the tips of all the major cusps of the posterior teeth, and that the anterior teeth protrude slightly through the lower surface of the template. This simple demonstra-

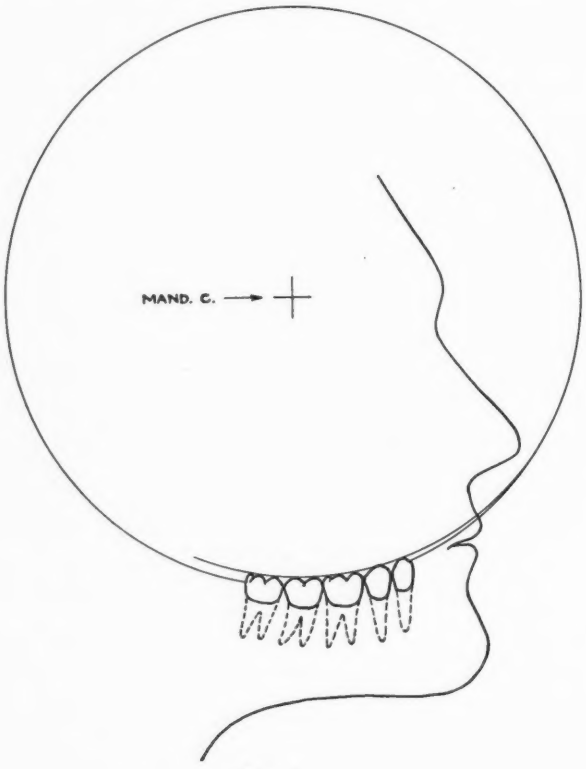

Fig. 2.

tion identifies the configuration of geometrical points about which I have spoken, the relative locations of which, and the separate respective motions of which, are so intimately associated with the structural and functional elements of an ideal occlusion.

Interpreted in terms of bilateral equivalents, Fig. 2 represents the collective vertical and sagittal dimensional relationships of the posterior mandibular teeth from a buccal perspective, the cusp tips lying in the surface of a sphere, designated as the mandibular sphere. The center of this sphere and the facial line are represented as lying in the median sagittal plane, whereas the cusp tips are shown as touching a short arc, a diagrammatic scheme to represent the upward curvature of the spherical surface as the distance from the median sagittal plane increases.

The radial dimension of the mandibular sphere is individualistic, and therefore a variable. As applied in normal dentition the radial dimensions range, in selected instances, from approximately three and one-half to seven inches. Fig. 2 recalls the commonly accepted premise "the curve of Spee," but differs from that premise in that definite unilateral and bilateral relationships are clearly indicated.

Fig. 3 shows an anterior bilateral view through the molar (a) and bicuspid (b) areas with the mandibular center located in the median sagittal plane—the tips of the buccal and lingual cusps of the molars, and the buccal cusps of the bicuspids, lying in the surface of the sphere. This drawing re-

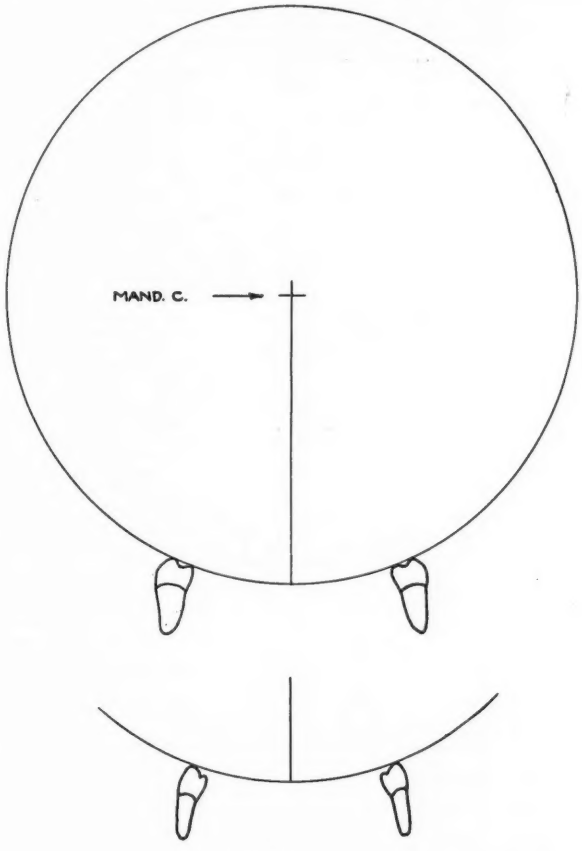

Fig. 3.

calls the commonly accepted premise "the compensating curve." The spherical relationships indicated by Figs. 2 and 3 suggest a possible correlation of the curve of Spee and the compensating curve, and leave little room for speculation concerning the application.

Fig. 4 is a median plane drawing showing a central incisor as protruding through the surface of the sphere.

Fig. 5*A* illustrates the location of the intersections of the labial surfaces of the six anterior teeth with the surface of the mandibular sphere. These intersections are located at a slight distance gingivally from the incisal edges of the central and lateral incisors, and the cusp tips of the cuspids, at the

position of occluding contact with the maxillary opponents, when centric occlusion obtains, as shown in Fig. 5*B*, which depicts opposing central incisors. I wish to direct your attention particularly to the differentiation in applica-

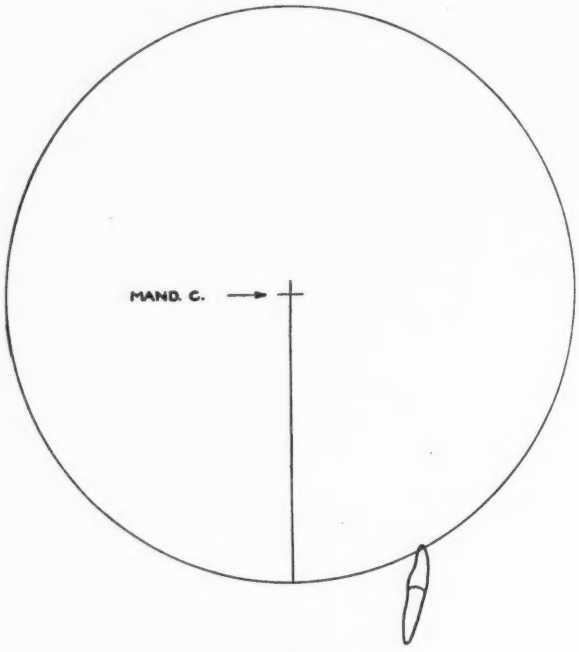

Fig. 4.

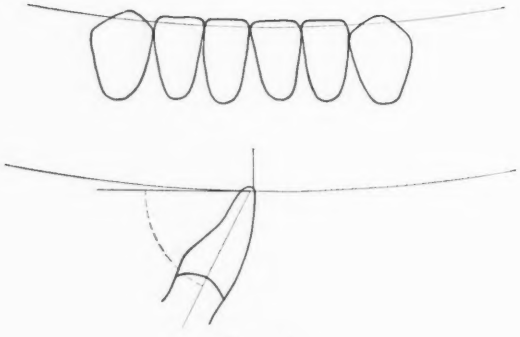

Fig. 5*A*.

Fig. 5*B*.

tion of curvature to the incising and triturating segments of the denture. This specific structural element is a common element of functional manifestations to be described.

Fig. 6 is a lingual perspective of the posterior mandibular teeth, the six molar cusps being shown as major cusps, in that their tips touch the spherical

surface, whereas the lingual cusps of the bicuspids are shown as minor cusps, in that their tips fail to reach the spherical surface.

The distolingual cusps of the molars can be designated as constants, in that their tips must always touch the spherical surface; whereas the mesiolingual cusps are variables in that they can either touch the surface, protrude through the surface, or fail to reach it, as shown in Fig. 7 *A* and *B*. In selected instances, the lingual cusps of the second bicuspids touch the spherical surfaces, as shown in Fig. 7*A*. Generally speaking, they are minor cusps and therefore variables as to height and collective relationship. Lingual cusps of first bicuspids are minors and variables, and in no instance do they touch the spherical surface.

The mandibular model with the spherical template in position, and Figs. 1 to 7 inclusive, identify a configuration of spherically related points associated with the ideal arrangement of the mandibular teeth. The two-dimen-

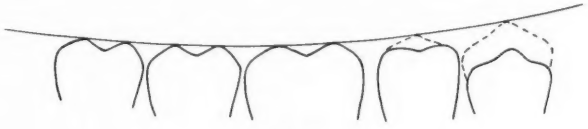

Fig 6.

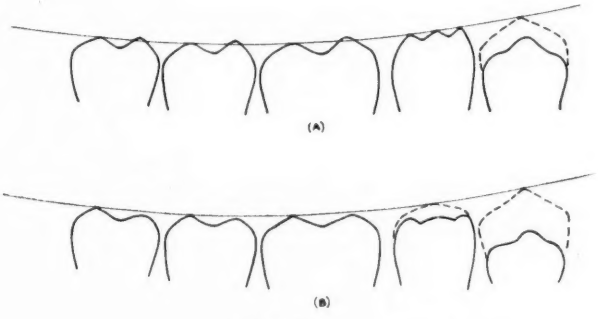

Fig. 7.

sional and three-dimensional motions of this configuration constitute the key to a determination of the structural and functional elements of dentition. The various points of this configuration lie within the surface of a sphere. Experimental evidence establishes the fact that when the mandible occupies the position commonly designated as extreme functional protrusive occlusion, the tips of six maxillary cusps lie in the surface of that sphere. These cusps are the lingual cusps of the maxillary molars. This factual circumstance permits an investigator to identify definitely a second configuration of spherically related points which, unlike the mandibular configuration, does not participate in functional motion. This collective maxillary relationship permits the use of a second sphere with cusp tips as landmarks of spherical application. This second sphere enables the investigator to study the collective two-dimensional structure of the cranially fixed maxillary denture, and serves as a basis for comparison of the structural analogy of the two dentures. This second sphere has been designated as the maxillary sphere. Particular

attention is directed to the circumstance that the maxillary and mandibular spheres have the same radial dimensions; also, to the fact that these two spheres are identical in time and space when the denture relationship known as extreme functional protrusive, obtains. Careful investigation has established the fact that in all instances of normal dentition the buccal cusps of the posterior maxillary teeth and the anterior maxillary teeth protrude through the surface of the maxillary sphere.

Fig. 8 shows a buccal perspective of the posterior maxillary teeth and their relationship to the maxillary sphere. The distance which the respective buccal cusps extend outside the sphere is orderly and constantly variable, but time will not permit any discussion of this relatively unimportant phase.

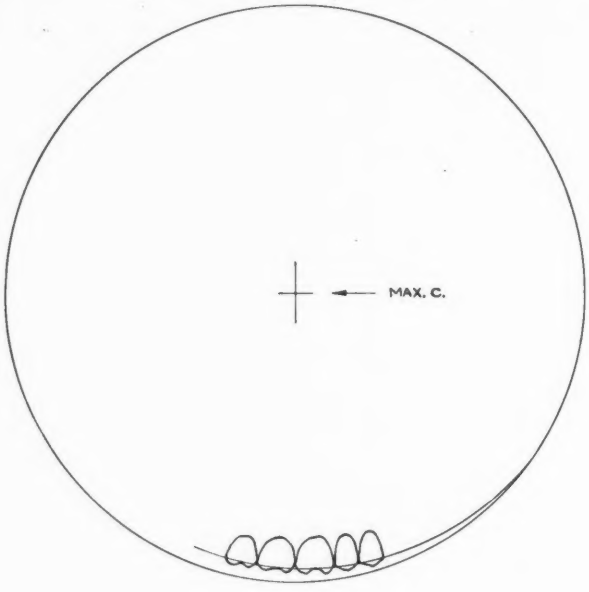

Fig. 8.

Fig. 9.

Fig. 9 illustrates a lingual perspective which depicts the lingual cusps of the molars as touching the concave surface of the maxillary sphere, and the distolingual cusps as failing to reach the surface. Generally speaking, the lingual cusps of the bicuspids are minor cusps, as shown; although in selected instances the lingual cusps of the second bicuspids attain a length which permits a classification as major. The tips of the lingual cusps of the first bicuspids never reach the spherical surface.

Fig. 10 shows labial surface intersections with the spherical surface. Unilaterally, the distance from the incisal edges and cusp tips at which these intersections occur is variable in all instances. Naturally the distance in ideal arrangement is identical in bilateral equivalents. The intersections may

occur approximately at the incisal edges of the lateral incisors, but in no instance does the surface of the maxillary sphere intersect the labial surface of the central incisors at the incisal edge. The ideal relationship of maxillary central incisors and the maxillary sphere is shown in Fig. 11 *A*. This relationship is an evolutionary adaptation which prevents the mechanical error, as shown in Fig. 11 *C*, both during and after the development of protrusive functional reflexes.

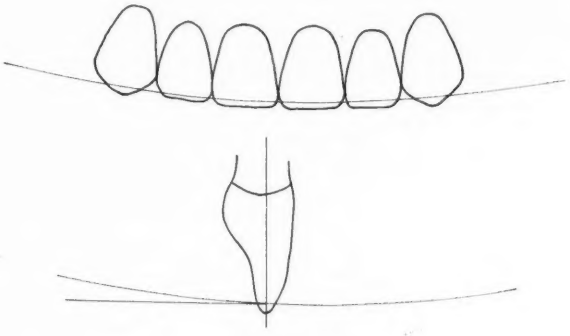

Fig. 10.

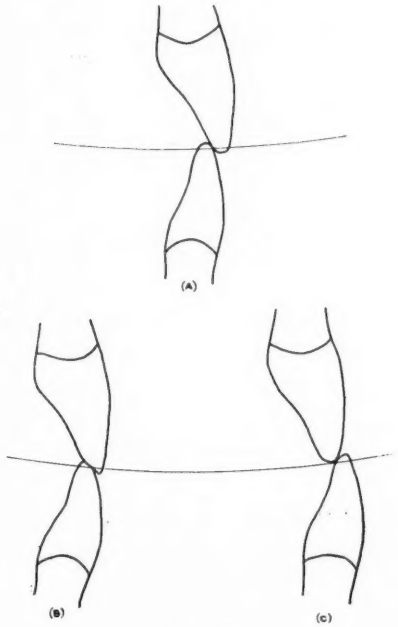

Fig. 11.

Fig. 12 is an anterior view showing the buccal cusps of the molars and bicuspids protruding through the surface of the maxillary sphere. The tips of the lingual cusps (molars and second bicuspids) are shown as major cusps, but in no instance do these latter cusps protrude through the surface of the sphere.

As indicated, there are but six cusp tips of the maxillary denture, namely, those of the lingual cusps of the molars, as compared with twenty-six of the mandibular denture, which can be classified as constants of spherical application.

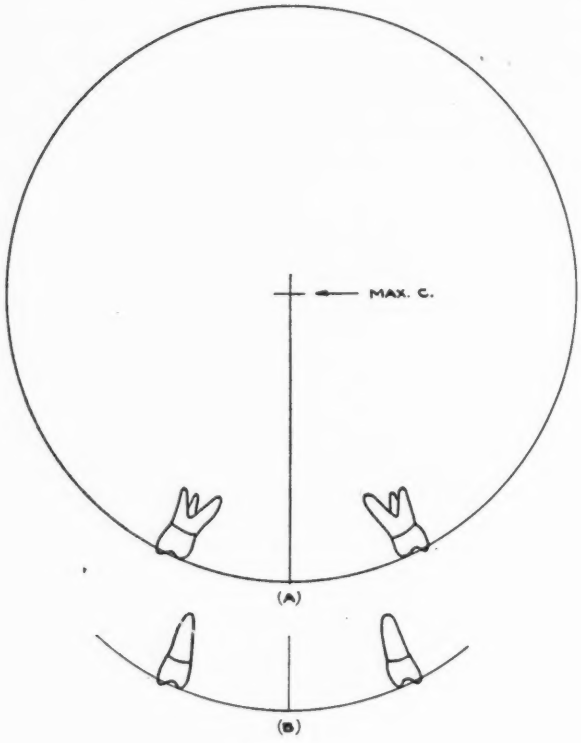

Fig. 12.

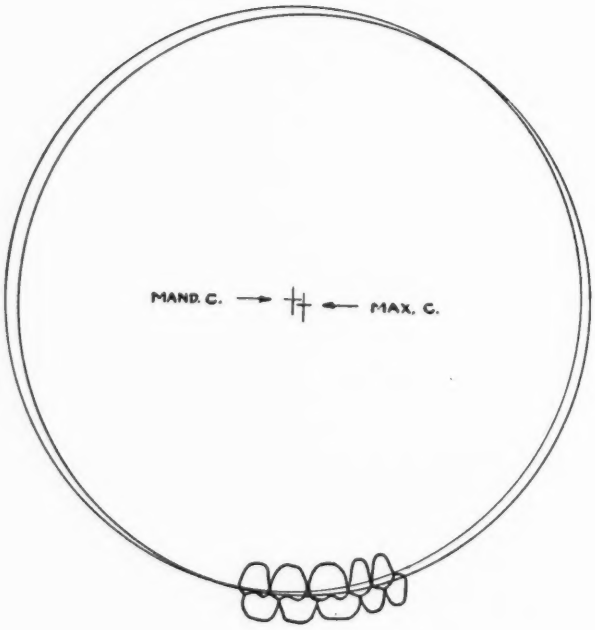

Fig. 13.

With the separate spherical relationships of the two dentures thus established, the interdependent structural elements of the dentures are resolved into surface relationships of a relatively fixed and a moving sphere, all the

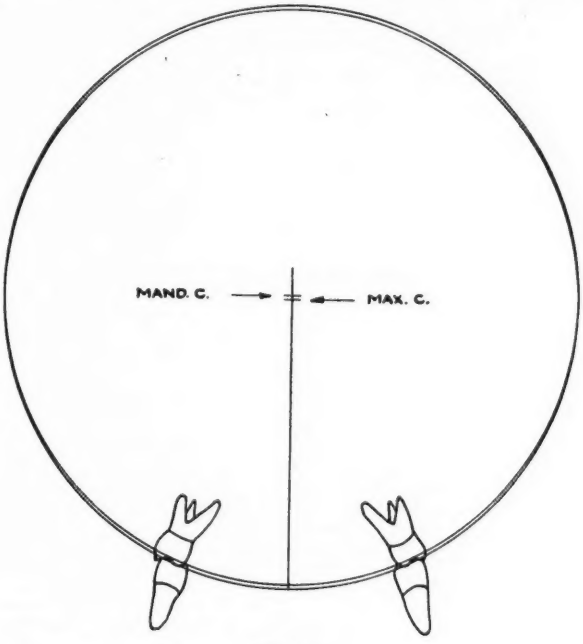

Fig. 14.

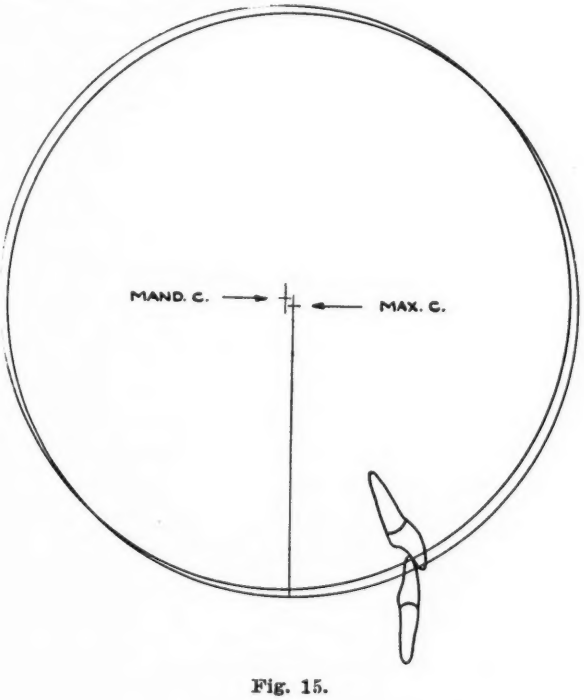

Fig. 15.

motions of which cease at a common extreme of the two-dimensional occluding range and of the two three-dimensional occluding ranges, namely, centric occlusion.

Fig. 13 shows the relationship of the maxillary and mandibular spheres at centric occlusion. Attention is called to the relative location of the centers of the two spheres.

Fig. 14 is a bilateral view through the molar region, showing the tips of the lower cusps touching the mandibular sphere, the lingual cusp tips of the maxillary molars touching the concave surface of the maxillary sphere, and the buccal cusps of the maxillary molars protruding through the surface of the maxillary sphere.

Fig. 15 is a median sagittal drawing which illustrates the spherical relationship of the anterior teeth, and relative location of the two centers when centric occlusion obtains.

Fig. 16 schematically illustrates the spherical relationship of two molar opponents, two bicuspid opponents, and two incisor opponents, when both

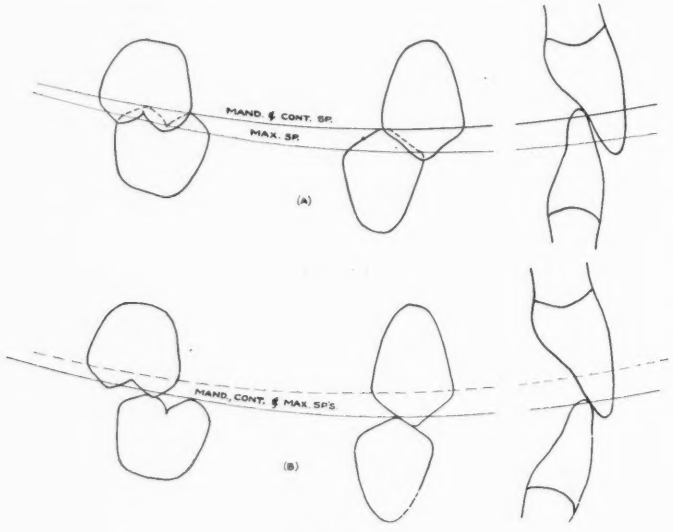

Fig. 16.

centric occlusion and extreme functional protrusive obtain. The excentricity of the two spheres at the former denture relationship, and their identity at the latter relationship, are clearly indicated—a factual circumstance not unexpected if the angular nature of mandibular motion and the equal degree of bilateral closure during two-dimensional motion are allowed to enter the deductions or experimental procedure.

With these tooth, denture, and spherical relationships experimentally established, the following geometrical postulates have been formulated relative to the collective vertical and sagittal relationships of ideal maxillary and mandibular dentures:

First, that the tips of all major cusps of the posterior mandibular teeth are arranged in such manner as to lie in the surface of a sphere, designated as the mandibular sphere, and in a tangent thereto;

Second, that the incisal edges and cusp tips of the anterior mandibular teeth, together with a small portion of their respective labial surfaces and a

slightly greater portion of their respective lingual surfaces, lie within the body of the mandibular sphere;

Third, that the tips of all major lingual cusps of the posterior maxillary teeth are arranged in such manner as to lie in the surface of a sphere, designated as the maxillary sphere, and in a tangent thereto;

Fourth, that the tips of the buccal cusps of the posterior maxillary teeth and the incisal edges and cusp tips of the anterior maxillary teeth, together with a slight portion lingually from the respective cusp tip or edge, and a slight portion of the surface labiobuccally from the respective cusp tip or edge, are arranged in such manner as to lie without the body of the maxillary sphere.

These geometrical postulates, although universally applicable, are somewhat indefinite in certain respects. They have been so formulated for the sake of hypothetical brevity and as a comparative standard to serve as an operative basis.

Careful analytical investigation has disclosed a further factual circumstance that the majority of the cusp tips serving as spherically related landmarks of the mandibular denture make functional contact, or occlude, with the maxillary teeth at both centric occlusion and extreme functional protrusive occlusion. Since these landmarks lie in the surface of a sphere, it follows that the points or positions of occluding contact, or occlusal stress, at each of these separate denture relationships, also lie in the surface of a sphere, a functional entity separate and distinct from the maxillary and mandibular spheres which are separate and distinct structural entities. This third sphere has been designated as the contact sphere, originally submitted as the contact occluding sphere. It will be noted that this sphere changed its relationship to the maxillary denture from that which existed at the initial instantaneous relationship of the two-dimensional occluding range to an entirely different relationship at the centric extreme of that occluding range.

With these circumstantial manifestations clearly in mind, even a superficial observation gives a very definite indication as to the connecting link, or common element, of morphology and function, namely, the application of some physical principle which will permit the existence of spherically related points of occluding contact at entirely different and widely separated instantaneous denture relationships which come into being as a result of three separate and distinct cycles of functional motion of the mandibular denture.

Spherical surfaces are said to be congruent when mutual conformity exists. Simply defined, the principle of spherical congruency means that if two spherical surfaces of equal radial dimension are brought into apposition, they become identical. In view of the facts (1) that functional motion includes not only occluding but non-occluding denture relationships, (2) that the two dentures with their structural spherical relationships are brought into apposition or contact, and (3) that the occluding or contact relationships are spherically identical in certain specific instances with the structural relationships, it appears logical to assume that the application of the principle of spherical congruency is the secret of the inexorably linked combination, structure and function.

The evidence submitted relative to the application of the principle of spherical congruency, although factual in nature and irrefutable geometrically, is not sufficiently comprehensive to establish the factual application of this principle to each of the multitudinous instantaneous denture relationships as they succeed each other during the two-dimensional and three-dimensional ranges, although the evidence establishes the factual application of this principle in two extremes of one occluding range, and in one extreme in each of the two other occluding ranges. However, this combination of circumstances is an indication, at least, that this principle is a common element of functional occluding ranges and structural nature.

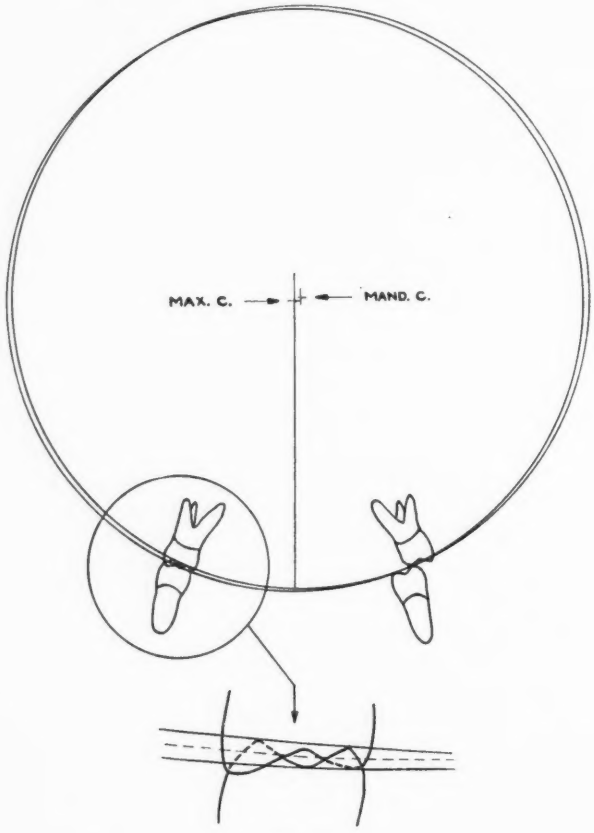

Fig. 17.

In normal dentition, the non-occluding portion of each of the two three-dimensional cycles of functional motion is terminated by the simultaneous contact on the functioning side of all opponents throughout the unilateral length of the two dentures. The continuous occluding contact of all opponents throughout the occluding range on the functioning side, and of the two opponents at the distal extremities of the dentures on the non-masticating side are easily observed relationships.

The staggered cusp interdigitations, the angular nature of the functional motion, the unequal degree not only of bilateral closure but also of unilateral closure throughout the unilateral lengths of the dentures, and the cessation of motion at the centric relationship, are factual circumstances, easily ob-

served and experimentally established. Correlating these factual circumstances with the geometrical relationships, both structural and functional, of centric occlusion, the spherical relationships of extreme lateral occlusion can be readily determined.

Fig. 17 shows a bilateral view through the third molar regions when extreme lateral occlusion obtains, the spherical surface and cusp tip relationships of the functioning side being enlarged for clarity of perception.

Attention is directed to the spherical identity of the structural and functional relationships on the non-functioning side, where it will be observed that the surfaces of the maxillary and mandibular spheres intersect at a common point with the point of contact of the tip of the distobuccal cusp of the mandibular third molar and the tip of the lingual cusp of the maxillary third molar. This point is the only point of occlusion on the non-masticating side, and hence the only point which lies in the surface of the contact sphere on that side. It also lies in the surfaces of the maxillary and mandibular spheres.

Fig. 18 shows a buccal and labial perspective of the spherical surface relationships on the functioning side as they exist at the initial instantaneous

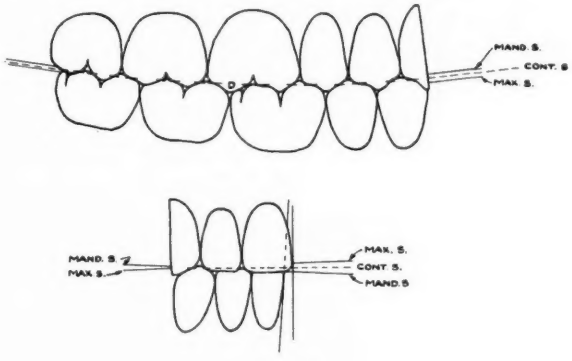

Fig. 18.

denture relationships under discussion. The surface of the contact sphere, indicated by the dotted line, is shown as occupying a position between the surfaces of the mandibular and the maxillary spheres along the length not only of the triturating segment but also of the incising segment. The surface relationships of the maxillary and the mandibular spheres are reversed in these two segments, owing to the common-point intersection of these three spherical surfaces in the region of the cusp tip of the mandibular cuspid.

To select out of the many occluding contact points any considerable number, and to identify definitely those which qualify as a spherically related configuration on the masticating side, as such configuration may obtain at either this initial instantaneous denture relationship or at any specific one of the multitudinous intermediate instantaneous denture relationships is an experimental procedure which lies in a field of complexity in which my mind refuses to function.

However, since the anatomic and contact relationships of occluding function are instantaneous in nature, the selection of but two points to use in

conjunction with the point of occluding contact on the non-masticating side is sufficient to fulfill the requirement for the presence of the contact sphere of function.

In view of the continuous occluding contact of all opponents during all functional ranges, the multiplicity of contact points at all instantaneous relationships, the harmony of structure and function as manifest by the smoothness and efficiency of action and the ever changing geometrical relationships, it seems logical to assume that many points (but not all) exist at any selected instance which fulfill the requirements for the functional application of the principle of spherical congruency.

With these many correlated thoughts in mind, the following geometrical assumption is offered relative to the instantaneous contact relationships of functional ranges. For the sake of hypothetical brevity, the assumption is stated as follows:

That the maxillary and mandibular teeth are so shaped and arranged by evolutionary processes that the mandibular denture, as a functional unit, makes continuous bilateral occluding contact with the maxillary denture, as a functional unit, during all instantaneous denture relationships of all occluding portions of all functional cycles of the act of mastication, by virtue of the existence of a configuration of moving points of occluding contact, the separate points of which configuration lie in the surface of a sphere, designated as the contact sphere of occlusion.

I wish to direct your attention to the fact that the assumption does not state that all points of occluding contact lie in the surface of the contact sphere. It does state that there are points which do, but time forbids not only technical argument in support of such an hypothesis, but also technical discussion of the ever changing relationships existing between the configuration of spherically related contact points and those which do not so qualify. However, aside from the many kinematic principles involved, the harmony of structure and function as manifest by the smoothness of action clearly indicates the application of the principle of spherical congruency.

The three geometrical postulates which I have offered deal specifically with a hypothetical ideal, and have been formulated as an explanation of the inalterably linked mechanical combination of structure and function. Careful analysis of the ever changing relationships of function demonstrates the identity of the maxillary, mandibular, and contact spheres at extreme functional protrusive occlusion, the identity of the mandibular and contact spheres at centric occlusion and the relative ever changing excentricity of all three spheres at all other denture relationships.

I wish to state that there never has been, and there never will be, an occlusion which conforms to the accuracy demanded by a geometrical assumption. However, it is my conviction that in a normal dentition the structural and functional elements, as formulated, obtain to the same extent and practical end (and, generally speaking, apply over a longer period of time owing to the automatic operation of the principle of Le Chatelier) that the structural and functional elements generally obtain in the mechanical adaptations of present-day material progress.

It is therefore my opinion that there is no practical need to distinguish between an ideal occlusion and a normal occlusion, provided the qualifying adjective, normal, is accepted to mean exactly what its definition implies, namely, "in accordance with an established law or principle," "conforming to a type or standard" and "natural."

The assumed reality of an ideal occlusion is indispensable to the construction of dental science, because the human mind can only function with complete freedom from confusion in the realm of the abstract. Such an abstract reality can be used to dissipate, to a considerable extent, the confusion occasioned by the multitudinous perversions encountered in malocclusion, owing to the fact that the perversion approximately fits the schemata of the ideal. It will be observed that a study of perversion constantly enriches and exalts the ideal.

Dental procedures are concerned with concrete facts, but their primary motivating force and objective, if scientific, arise in the realm of symbols. The well-established principle of natural variation, with its implication of universality, consigns the student of dentistry to a land of confusion and argument, which settles nothing, unless a well-defined and acceptable hypothetical ideal can be established as a basis of comparison. Careful observation and interpretation of facts in nature, supplemented with experimentation, constitute the only acceptable basis for the definition of a specific ideal. However, notwithstanding the acceptance of the ideal, the student must be forever cognizant of the fact that nature in no instance follows laws as formulated by man. Man-made laws are simply man's best effort to explain the complexities of nature, which, after all is said and done, is an unattainable objective.

In the introduction I stated that I believe this conception of occlusion has a factual foundation in nature. The practical application by the orthodontist of the principles enunciated will readily establish the validity or fallacy of such an opinion.

If cusps interfere with the continuous occluding contact of functional opponents, the principles advocated have not been applied. Continuous occluding contact of opponents is mechanically dependent upon relationships in practical conformity with the geometrical postulate.

3305 Pittsfield Bldg.

DISCUSSION

Dr. Howard E. Strange.—Dr. Maxwell indicates that fundamentally there are many factors which contribute to the balance of a tooth, or teeth, in function, and that certain relationships, both separate and coordinate, are spherical in nature, and in certain instances are actually spherically identical. The teeth are held in suspension by the fibers of the peridental membrane, and the changes or variations in root forms and numbers (single and multiple) reflect the work that the teeth are individually going to do. There is a mutual relationship of each tooth to the other in the arch and in turn a definite relationship of the teeth in one arch to the opposing arch.

There must be a definite inclined axial positioning of the denture units, and each unit (lower and upper meeting in a contact occluding sphere) may be considered as an active

component force. The meeting of these mesially inclined vectors results in an anterior resultant force. This resultant action is an anterior propelling force, and an equilibrium is maintained by the backward force exerted by the muscles of the lips and cheeks.

There is a definite vertical positioning of the teeth anteroposteriorly and buccolingually, and the normal positioning of each dental unit in the arch resolves itself into a geometrical spherical congruency. Dr. Maxwell has clearly and specifically indicated that there is an element of concavity associated with the mandibular denture (movable part) and an element of convexity associated with the maxillary denture (fixed part). The position of the temporomandibular articulation and the nature of the joint would seem to necessitate this curvature or apparent contact occluding spherical relationship. An anatomic relationship of this type permits two-dimensional movement, three-dimensional movement, and an ease of action and balance with muscular action in the functional movements of the teeth and jaws in mastication.

"Functional activity involves motion, and centric relationship is of no more importance than each and every one of the innumerable instantaneous denture relationships where motion is involved" is a very important statement from Dr. Maxwell's paper. The thought in that sentence indicates that we cannot confine our observations of jaws and teeth in denture relationship to centric occlusion alone. In order to secure a complete picture of occlusion we must observe and study all the functional ranges where motion is involved. If we confine our observations to a centric occlusion, we are observing a static relationship. When we project our observations into the path of travel of mandibular cusps and condyles in functional ranges or dynamic relationships, the analysis or picture is more complete.

Occlusion is nature's plan that has evolved from simple forms, and the pattern of occlusion through the process of evolution has gradually become more complex. There is a definite relationship of organisms to environment, and differences of environment change the demands for maintaining existence, and that primarily accounts for the change from simple cones in primitive forms gradually to the more complex though ideal mechanism that exists in the human today. The environment in the present period of evolution demands a definite fixed and fundamental plan of arrangement for the functional units of the denture and related parts.

We all know or realize that there never will be an occlusion which conforms to the accuracy demanded by a geometrical assumption. However, every person engaged in the practice of dentistry should thoroughly be acquainted with Dr. Maxwell's geometrical postulates. He has called them a hypothetical ideal, but I would prefer to enumerate or understand them as practical ideals that demand careful and thorough study. The teeth are held and placed by a group of factors, some static and some dynamic, and only so long as these forces stay in balance will the teeth stay in normal occlusion. As soon as there is an upset or a disturbance in one of the elements that maintains normal occlusion, there is a resulting deviation from a normal, well-balanced mechanism.

CONTROL OF CARIES DURING ORTHODONTIC TREATMENT

FLOYD E. GIBBIN, D.D.S., BUFFALO, N. Y.

IN ORTHODONTIC practice there are many and varied responsibilities. While all phases of practice are important, yet unquestionably a very definite and effective effort should be made in the control of caries during treatment. A survey of our literature reveals comparatively little written on this subject in relation to its great importance.

Much unfavorable criticism has been directed at orthodontic service by both the laity and the profession. True, much has been accomplished in reducing the incidence of caries during treatment, but even so the idea is still held by many parents that excessive tooth destruction is the penalty which must be paid for having "teeth straightened." It is not at all uncommon to hear of dentists who have not recommended orthodontic treatment where indicated, or who have even advised against treatment because they feared excessive destruction through caries. Granted that a portion of this criticism is entirely unjustified, yet we must admit that a certain amount of such criticism probably is justified. Either way, it constitutes a handicap to orthodontic progress. Further, many delicate and embarrassing situations have arisen between the general practitioner and the orthodontist over the early detection of caries and its prompt treatment.

Who or what is responsible for this situation? Is it the general practitioner or is it the orthodontist? Is it a lack of cooperation and, if so, who is responsible? Is it a lack of interest on the part of the patient and the parent and if so, why, and again who is responsible? It is only too evident that it is a joint responsibility, which requires a high degree of cooperation on the part of patient, parent, general practitioner, and orthodontist, if the best interest of the patient is to be safeguarded. True, there are general practitioners who are rendering a splendid service through effective education of the patient as to the genuine value of preventive dental service. But, unfortunately, we have not yet reached the point where a preventive service of value is widely practiced. Due to the closer contact and confidence developed through frequent and periodic visits to his office, the orthodontist has a splendid opportunity to assist materially in a more effective control of caries.

Our lack of knowledge of the etiology of caries is a handicap. Fortunately, however, we do possess sufficient knowledge of the control of caries that much has been accomplished and much more will be accomplished when the rank and file of the profession as well as the laity realize the genuine value of preventive dental service.

Read before the New York Society of Orthodontists, March 15, 1937.

We do know and are agreed that:

1. Dental caries is a complex disease process, the most prevalent of all diseases affecting mankind.

2. It attacks about 90 per cent of all civilized people.

3. We have no known specific method of absolute prevention.

4. Caries cannot be controlled by the mysterious cure-all ingredients of highly advertised tooth pastes and powders, nor by a bottle of pills on the shelf, nor by a package of some food concoction of supposedly great nutritional value on the pantry shelf.

5. Our symptomatic and mechanical treatment has been notably successful.

6. The problem can be successfully attacked only by the expert knowledge, skill and ability of the dentist.

Dr. Russell W. Bunting in an address on the "Control of Dental Caries" enumerates the following established facts:

1. No consistent relationship has been found between the hardness of perfection of the teeth and the activity of dental caries.

2. No correlation has been demonstrated between the amounts of salivary calcium, phosphorus, chlorides, pH, CO_2 capacity, total alkalinity, total solids or ash, and the activity of dental caries.

3. No relationship has been demonstrated between the intake of calcium, phosphorus, or acid-base dietary values and the activity of dental caries.

4. Inherited tendencies or inherent individual characteristics, in a small percentage of cases, are more important determining factors in dental caries than ordinary dietary conditions. A great majority of caries-susceptible individuals, however, can apparently be benefited by the adoption of very simple dietary measures.

5. Evidence is submitted indicating that sugar is a very important consideration in dental caries. A remarkably low degree of dental caries was observed in children on a low sugar diet deficient in calcium, phosphorus and vitamin D. Active caries was induced in children by increasing the sugar intake while they were receiving a diet that was nutritionally adequate. The ingestion of low sugar diets by children, as a rule, is conducive to freedom from dental caries.

6. The most constant differential between caries-free and caries-susceptible individuals thus far demonstrated is that of the relative number of *B. acidophilus* organisms in the mouth. This correlation is approximately 90 per cent positive.

7. An immunologic principle antagonistic to *B. acidophilus* has been demonstrated in the blood of caries-free individuals, in whose mouths, as a rule, *B. acidophilus* does not exist, and when planted therein promptly disappears. The possibility of controlling dental caries by vaccine therapy is suggested.

The practical measures of proved value available in the control of caries consists of:

1. The early detection and repair of all carious cavities.

2. An effective program of mouth hygiene, thoroughly understood and mastered by the patient.

3. The feeding of simple, uniform adequate diets in which sugar is reduced to a minimum.

An adoption of these measures will not insure absolute freedom from dental caries, but, as has been demonstrated in many large groups of institutionalized children, will greatly reduce caries in the great majority of children.

By what means can the orthodontist most effectively assist in the control of caries?

An orthodontic appliance in itself cannot be a cause of caries. It can, however, be an important contributing factor depending upon the extent to which it limits the maintenance of hygienic conditions in the mouth. Obviously, simplification of appliance design is a highly important factor in the control of caries.

To next place of importance would go education of not only the patient but the parent as well, preferably the mother, in order that we may secure their intelligent and enthusiastic cooperation. This is just as important as any other phase of orthodontic treatment. A separate appointment with sufficient time to explain the subject thoroughly has been found most successful. This discussion should include:

1. What we do and do not know about the cause of caries.

2. What we do know about the control of caries.

3. The importance of periodical prophylaxis and examination by the patient's dentist, stressing the importance of prevention rather than cure, stressing the cost of neglect as being far greater than the cost of treatment.

4. The story should be told in a simple, easily understood way, illustrated with models, photographs, and charts to make it easily understood.

A cooperative "service of prevention" has a very definite place in orthodontic practice. All patients should be referred to their dentists periodically for prophylaxis and examination. Most authorities are agreed that this should be done at least every four months. Obviously, if a thorough prophylaxis and examination are to be performed by the dentist, all appliances, bands and ligatures must be removed.

The following plan for such service is offered with the hope that it will produce as successful results in your practice as it has in mine.

Instructions for Home Care of the Mouth.—These definite instructions, which can be referred to at any time, have proved a splendid addition to the verbal instructions which sometimes are forgotten. It is suggested that the patient pin these instructions on the wall of the bathroom or bedroom to serve as a constant reminder.

Instructions for Home Care of the Mouth

A clean healthy mouth is highly important during orthodontic treatment, hence your mouth should receive diligent prophylactic care at home.

1. The teeth and appliances should be carefully brushed after each meal—and especially before retiring. Spend at least two minutes in brushing your teeth—this means two minutes by the clock.

2. There are different methods of brushing teeth. Consult your dentist and have him show you the method best suited to your particular mouth.

3. Use a small stiff-bristled brush. After using, it should be carefully rinsed under the water tap and allowed to dry thoroughly. It is wise to have two brushes and use alternately which permits each brush to dry completely before it is used again. Get new brushes frequently—a worn soggy brush is worthless. Use any good dentifrice on the brush—but remember, that the most important thing is proper and sufficient brushing.

4. The use of the following mouth wash, which is a highly effective preventive, is strongly urged after brushing. It is inexpensive and your druggist can easily prepare it.

Powder for Making Mouth Wash

Saccharin	12 gr.	The first two ingredients have to be thoroughly triturated in the mortar, so as to insure a fine powder. The calcium oxide is added, thoroughly mixed with it and finally the sodium chloride is added. The mixed powder should be passed through a coarse sieve so as to form a uniform mixture.
Menthol	15 gr.	
Calcium oxide	150 gr.	
Sodium chloride	1 lb.	
Phenolphthalein	1 gr.	

Dissolve a quarter of a teaspoonful of the above powder in half a glass of warm water. Use this to vigorously rinse the mouth, forcing the solution back and forth between the teeth.

5. Remember that tooth decay is nothing but disease seeking an entrance into your body. This can easily be prevented by visiting your dentist every four months for examination and prophylaxis. The smallest cavity can be detected and immediately filled, thus preventing unnecessary disease, pain, loss of valuable tooth structure and expense.

6. *Taffy, caramels or other sticky substances must always be avoided during treatment,* inasmuch as they adhere to the appliances and are liable to disarrange and get them out of order.

7. *Distortion of appliances with tongue or fingers must be avoided at all times.*

Both patients and parents are urged to cooperate in carrying out the above instructions in order that the best results may be obtained.

Sincerely yours,

FLOYD E. GIBBIN

The Referred Service Record.—The Referred Service Record has been found a convenient means of listing the names of patients and the dates when they should be referred to their dentist for prophylaxis and examination. It provides for a definite record when notices are to be sent to the patient, the parent and the dentist. The result obtained is recorded in the result column, and then the patients' names are carried forward four months to a new record. The result is also entered on the patient's treatment record. When a new case is started, the patient's name is entered on the Referred Service list four months from the date the case is started. The advantage of this is only too obvious—it takes the guess out of guesswork. (Fig. 1.)

The Quarterly Report of Case Progress.—The Quarterly Report of Case Progress, as suggested by Dr. Paul Spencer, notifies the parent that it is again time for an appointment with the family dentist for a prophylaxis and examination. It also keeps the parent informed of the progress of the case, the degree of cooperation shown, the care of the mouth and appliances, the regularity of appointments, and other things which are essential for the parent to know. (Fig. 2.)

Notice to Patient.—This card is given to the patient at a regular appointment and it helps to win his or her cooperation and develops a sense of responsibility. (Fig. 3.)

Notice to Dentist.—This reminder to the dentist not only enables him to arrange an appointment if the patient or parent neglects it but indicates our endeavor to cooperate with him and is thoroughly appreciated. (Fig. 4.)

REFERRED SERVICE RECORD
FOR
PERIODICAL PROPHYLAXIS AND EXAMINATION

January 19 37

NAME	QUARTERLY REPORT TO PARENT	CARD TO PATIENT	CARD TO DENTIST	RESULT
Mary Ann Kelley	1/15/37	1/15/37	1/15/37	P. & Ex. 1/20/37
John Pierce	"	"	"	P. & Ex 1/22/37
Thomas Gardner	"	"	"	P. & Ex 1/19/37
Ruth Burbank	"	"	"	P. & Ex 2/1/37
Carol Wilson	"	"	"	P. & Ex 1/27/37
William Cleveland	"	"	"	
George Rankin	"	"	"	P. & Ex. 1/21/37
Elizabeth Jones	"	"	"	P. & Ex. 2/5/37
Louis Smith	"	"	"	P. & Ex. 2/6/37
Virginia Keller	"	"	"	P. & Ex 1/28/37
Jeanne Thompson	"	"	"	P. & Ex 2/9/37
Patricia Raye	"	"	"	P. & Ex 1/28/37
Francis Lake	"	"	"	P. & Ex. 2/3/37
Doris James	"	"	"	P. & Ex 1/26/37
Kenneth Taylor	"	"	"	P. & Ex 2/7/37
Marion Schooley	"	"	"	
Cary Williams	"	"	"	P. & Ex 2/9/37
Marie Bishop	"	"	"	P. & Ex 1/20/37
Laurance Randall	"	"	"	P. & Ex 1/19/37
Terrance Gall	"	"	"	P. & Ex 2/3/37
Gale Winslow	"	"	"	P. & Ex 1/22/37
Mae Braoss	"	"	"	P. & Ex 2/3/37
Geraldine McGuire	"	"	"	P. & Ex 2/1/37
Thomas Brown	"	"	"	P. & Ex 2/9/37
Alice Abbott	"	"	"	P. & Ex 1/29/37
James Moran	"	"	"	
Pearl Pressley	"	"	"	
Anne Lee Winsick	"	"	"	P. & Ex. 2/1/37
Joan Reynolds	"	"	"	P. & Ex 1/18/37
Carl Walters	"	"	"	P. & Ex 1/20/37
William Bancroft	"	"	"	P. & Ex 1/27/37
Lewis Hopkins	"	"	"	P. & Ex 2/8/37
Virginia McCall	"	"	"	P. & Ex 1/27/37
Susan Burns	"	"	"	P. & Ex 2/4/37
Russell Doyle	"	"	"	
Doris Jean Bailey	"	"	"	P. & Ex 2/5/37
Betsy Sullivan	"	"	"	P. & Ex 2/7/37

DR. F. E. GIBBS, BUFFALO, N. Y.

Fig. 1.

Every logical reason points to the necessity for the orthodontist to enlist his active support in the crusade for the control of caries. First, he owes a definite obligation to his patient to help safeguard normal mouth health in every possible way. Second, he owes a definite obligation to his profession to promote all health measures which will better the standing and increase the prestige of his profession. Third, he will experience an appreciative co-

DR. FLOYD E. GIBBIN
888 LINWOOD AVE.
BUFFALO, N. Y.
PRACTICE LIMITED TO ORTHODONTIA

Quarterly Report of Case Progress
For

Mary Ann

Mr. and Mrs. Gordon S. Kelley
264 Winslow Avenue
Buffalo, New York

Dear Mr. and Mrs. Kelley:

It is again time for Mary Ann to visit your dentist for Prophylaxis and Examination. May I suggest that an appointment be arranged as soon as possible?

Treatment of her case is progressing according to items checked below. Your attention is also called to those items pertaining to instructions which apparently are not being carried out.

Appointments have been — Regular — Irregular. ✓

Number missed since last report. 2

Intermaxillary Elastics are NOT being worn as directed — At Night — Daily — Correctly — Regularly. ← ?

Patient is NOT following instructions as required regarding daily exercise of —Lips — Tongue — Proper Breathing, etc. ← ?

Home care of Mouth and teeth { Excellent / Good / Fair ✓ / Poor }

Care of Appliances—Good—Fair ✓—Poor. Probable Causes: { Tongue Habits / Sticky Foods / Removing Ligatures / Distorting Appliances with Fingers }
Times broken since last report. none

Desired progress of the case to date has been — Excellent — Good ✓ — Fair — Poor.

May I urge your cooperation in carrying out the above instructions in order that the best results may be obtained?

Sincerely yours
Floyd E. Gibbin

Fig. 2.

Mary Ann Kelley
January 15 1937

IT IS AGAIN TIME FOR YOU TO VISIT YOUR DENTIST FOR PROPHYLAXIS AND EXAMINATION. MAY I SUGGEST THAT YOU ARRANGE AN APPOINTMENT AS SOON AS POSSIBLE?

DR. FLOYD E GIBBIN.

Fig. 3.

operation, a greater appreciation of his efforts from the general practitioner. Fourth, he will more effectively safeguard the success of his orthodontic correction, which is so largely dependent upon a normal healthy mouth. And last but not least, he may enjoy the satisfaction of fully doing his part in rendering a more conscientious service.

DR. FLOYD E. GIBBIN
333 LINWOOD AVE.
BUFFALO
PRACTICE LIMITED TO ORTHODONTIA

January 15, 1937

Dr. Lester W. Ames
2574 Garfield Avenue
Buffalo, New York
Dear Doctor Ames:

I have advised Mary Ann Kelley together with her parents that it is again time for her to visit you for Periodical Prophylaxis and Examination.

I have urged an appointment at your earliest convenience and trust that they will comply promptly.

Sincerely yours,
Floyd E. Gibbin

FEG:BMR

Fig. 4.

DISCUSSION

President Barber.—May I congratulate you, Dr. Gibbin, on a wonderfully presented paper. It was very thorough, and it certainly is a revelation to see that some one is trying to do something constructive along these lines. I am sure it has been very well received. We have not time to discuss it, but I do not suppose that there could be very much discussion concerning it for everything that Dr. Gibbin has said is absolutely true. If we could all do some part of this work that he has suggested I believe that our patients would be a whole lot better off, and there would be a better understanding between every one. It is something that is a bugbear to all of us because it is such a ticklish proposition. Somebody always has to take the blame for these things, and if we know how to handle them and can keep check on them, I believe we have done a great service to the patient, and incidentally have helped the general practitioner as well.

CASES OF CLASS I AND II WITH ENDOCRINE INVOLVEMENT

H. L. Morehouse, D.D.S., Spokane, Wash.

WHEN I was asked to give a case report for this meeting, the thought came to me that if a report on some cases of known hypothyroidism could be given by one who is not doing research work, perhaps more orthodontists might be stimulated to diagnosis of their cases better through more careful study of the roentgenogram records; and, when real indications are found, have a basal metabolic test made; then report the findings to a research laboratory such as the George William Hooper Foundation in San Francisco with which Dr. Hermann Becks is associated, thereby assisting in this important work. We need the research men, and they need all the clinical reports that we can give them.

About ten years ago the late Dr. Ketcham gave a preliminary report in connection with root resorption during orthodontic treatment. This almost wrecked our faith in orthodontic appliances but was the stimulus needed to intensify the research work already started and along new avenues, so that now we have some definite facts established.

I am afraid too many of us listen to reports of the research work being conducted by such men as Becks, Oppenheim, Marshall, and many others, without much serious thought afterward; so I hope this case report will serve its purpose.

Dr. Becks' research work on the endocrine glands and their relation to bone development and root resorption is well known to all of you. I have had the privilege of Dr. Becks' friendship for a number of years and have followed his work with a great deal of interest. He has been very generous with his advice and suggestions in a number of cases. The roentgenograms of the first two cases that I will show were marked by Dr. Becks personally.

I am showing roentgenograms of three cases which I know from their basal metabolic tests to be cases of real hypothyroidism, and therefore the indications that are present in the alveoli of the maxillary and mandibular arches as well as the roots of the teeth cannot be misinterpreted.

The first case is one of a girl for whom I began orthodontic treatment in November, 1927, at the age of seven years and ten months, expanding the deciduous denture and making room for the maxillary and mandibular incisors to be placed in their normal position. This treatment covered a period of about a year and a half with some rest periods during that time. At this age the hypothyroidism was not detected, and my orthodontic appliances were removed in June, 1929. Then, according to the records of the Sansum Clinic in Santa Barbara, California, to which she was taken for test and treatment on April 5, 1932, the basal metabolic test showed a –22 reading. The records that I have do not show how long she remained there for treatment, but it was continued for

Presented at the Thirty-Fifth Annual Meeting of the American Society of Orthodontists, Chicago, April, 1937.

some time. She was started on one grain of thyroid and gradually increased to eight grains daily. How rapidly the dosage was increased is not shown in the records that were sent me.

She returned to me for a secondary orthodontic treatment in February, 1933, and the appliances were replaced the last of March that year. During the period between June, 1929, and March, 1933, she had developed through a

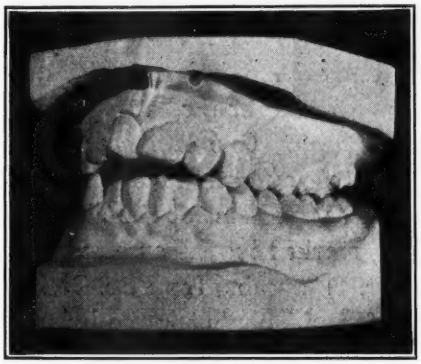

Fig. 1.

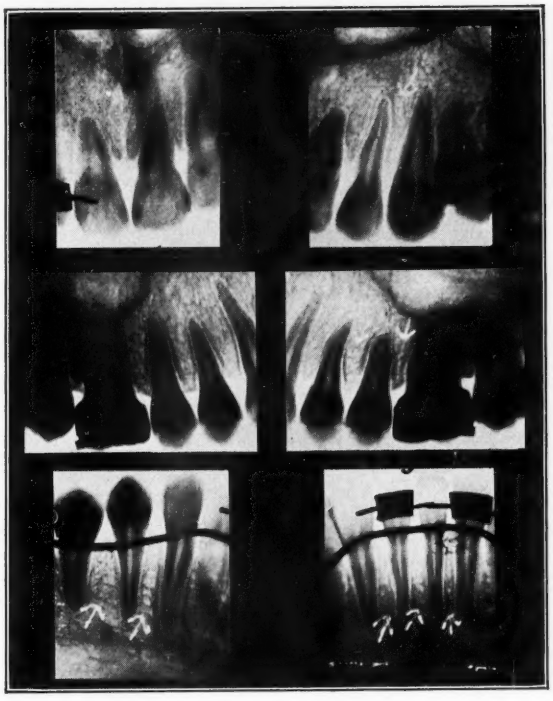

Fig. 2.

Fig. 3.

Fig. 4.

tongue habit an aggravated superocclusion in the premaxillary region and a slight contracting of the maxillary arch (Fig. 1). This secondary treatment was continued very slowly until January, 1934.

In February, 1934, she returned to the Sansum Clinic for a check-up and for further treatment for the hypothyroidism because her general condition had not shown satisfactory results; her basal metabolic test then gave a reading of –16 not quite two years after the first test. This time she remained there six months.

On July 1 of that year she returned again for further orthodontic treatment with the tongue habit still dominant; at this time very light stimulus was instituted in the maxillary incisor region for vertical development. The response to the orthodontic treatment, during all this time, was perfectly normal except in the premaxillary region where it seemed almost impossible to overcome the superocclusion of the maxillary incisors. Tongue exercises were given all this time, but they were not thoroughly carried out.

The roentgenograms of this case show a shortening of the maxillary incisor roots (Fig. 2) but not the usual resorption. Time does not permit me to show the entire set of roentgenograms, but the condition which you see in the slides was typical of the entire mouth. One of the effects of the hypothyroidism is indicated by the interdental osteoporotic lesions throughout the entire mouth as indicated by the resorption of the crest of the alveoli as well as the little dark bubble-like spots (Fig. 3), marked by the arrows, which are another indication of the hypothyroidism (Fig. 4), quoting from Dr. Becks: "They suggest that the normal processes of bone formation, that is the balance between resorption and deposition, has been disturbed." I finally felt that it was inadvisable to make any further attempt to bring the maxillary incisors into occlusion, so I discontinued the treatment December, 1935, with normal occlusion having been established except in that region.

She returned to Santa Barbara in February, 1936, at which time her basal metabolic reading gave –1 and again in June, 1936, her reading was +6 showing the effect of the thyroid therapy. During the past year and a half I have had her teeth under retention with a Hawley retainer with a labial bow to help stabilize the maxillary incisors to give nature complete freedom in whatever she might attempt to do, and the result has been more than pleasing, as the maxillary incisors at Christmas time had almost established an end-to-end occlusion with the mandibular incisors. The hypothyroidism has been overcome, and her weight has been very decidedly reduced and maintained.

The next case is one of a young lady eighteen years of age, height five feet six inches, weight one hundred and forty-five pounds. She presented herself for orthodontic examination in August, 1936, at which time the models of her case (Fig. 5) were made. Her tongue was at least a third oversize; in fact, it was so large that when it lay passive in the floor of her mouth it covered the entire occlusal surface of the mandibular molars and the bicuspids (Fig. 6). I immediately suspected hypothyroidism due to the enlarged tongue and other characteristics that were evident in the rest of her physical development. I persuaded her father to have her basal metabolic test made. The physician reported that her reading was –22 with a decided indication of slight hyperpituitarism; this last conclusion was indicated by the extreme tapering fingertips. You will also note the same tapering condition of the maxillary incisor roots (Fig. 7). The same interdental osteoporotic lesions can be seen along the entire crest of the alveoli of the mandible and maxilla and the dark bubble-like spots as shown in the first case. I sent these roentgenograms to Dr. Becks, and the markings that you see on these roentgenograms were made by him indicating typical thyroid or pituitary involvement, or both.

These little areas that are marked (Fig. 8) with the arrows again indicated "the circulatory disturbances in the systemic imbalance which shows a very irregular disturbance of the bone trabeculae." Quoting further from his letter to me after examining these films: "One has the impression that the bone substance has been destroyed and replaced with an increased speed. The root ends

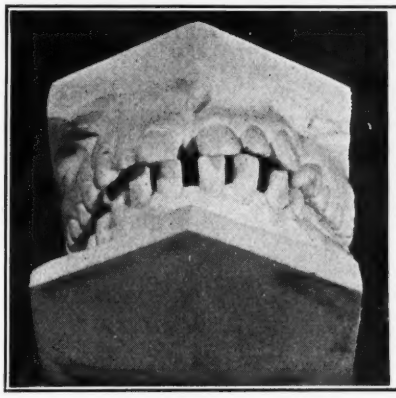

Fig. 5.

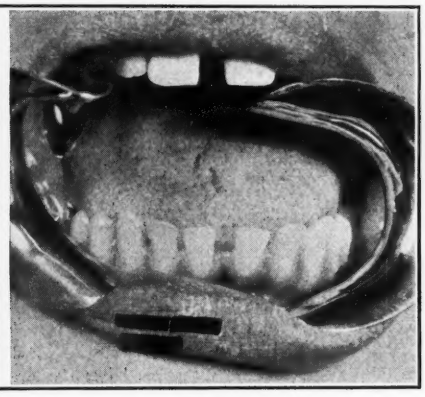

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

of the maxillary incisors and also some of the other teeth show a peculiar pointed effect, which is frequently found in association with thyroid dysfunction. Whether it is pathognomonic of such a condition or not we are unable to say at the present time [Fig. 9]. The formation of multiple pulp stones as seen in the anterior and posterior teeth also seems to be indicative of slow cell activity or degenerative processes of tissue which is found in 60 per cent of cases of hypothyroidism."

He advised that orthodontic treatment be postponed for six months or a year during the thyroid therapy, as he feared it might result in root resorption; but added that he would like to be convinced that such would not take place. The deformity of the features was such that I felt I was justified in attempting to reduce, if possible, some of the condition that existed. I therefore instituted a very slow stimulus with the use of labial appliances on both maxillary and mandibular arches. This was carried on until January, 1937, at which time the facial deformity had been somewhat reduced and the appliances are now in a passive state. At the present time there is no marked sign of any resorption taking place in the roots, but I expect to have roentgenograms of them every few months to check on the question. I referred her to her physician in Kellogg, Idaho, who instituted thyroid therapy, and he reported in February that in two weeks she had lost six pounds in weight. A second basal metabolic test has not as yet been made.

The third and last case which I am presenting is one of a girl from Bozeman, Montana, whose mother brought her to me for orthodontic examination and treatment in July, 1936, age nine years and eight months. I am showing this

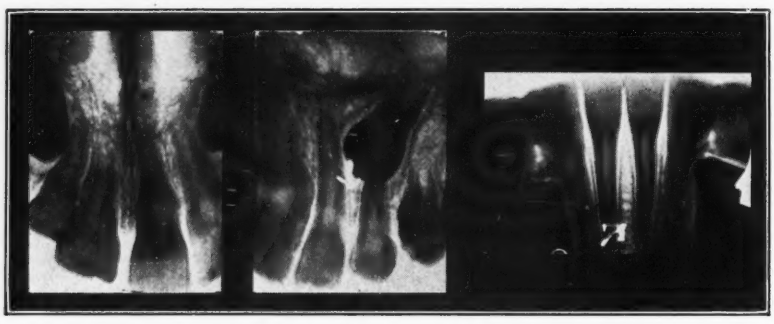

Fig. 10. Fig. 11.

case because it is of a mixed denture and one in which the hypothyroidism was detected at this early age through orthodontic examination. During the orthodontic examination the question of hypothyroidism did not suggest itself to me, but a month later when she came back for her appointment I had had time to study her roentgenograms and to think over her general appearance. I asked her mother if she had ever been examined for any thyroid disturbance and found she had never been suspected of it. I advised her that when she returned home she have a basal metabolic test made of her daughter, which she did. The following record is quoted from her physician's letter: "Weight one hundred five pounds, height fifty-five and and one-quarter inches; her normal weight should have been seventy-two pounds. Her excess weight seemed to be evenly distributed throughout her entire body, and her blood pressure and pulse readings were normal. However, her basal metabolic test showed a –33 reading." These data were made in August, 1936, and she was put on one-half grain of thyroid morning and evening with a diet low in fats and carbohydrates, and the thyroid was increased until in January, 1937, she was taking one grain of thyroid three times a day. Her weight had been reduced to one hundred one pounds without any unpleasant reaction from the thyroid therapy. She is feeling mentally more

alert and physically more active. Quoting from Dr. Eneboe, the girl's physician, "H's basal was rechecked March 14 with a reading of –18, her weight is now ninety-eight pounds as against one hundred and one on January 16, gain in height of three-quarters of an inch."

Again time does not permit me to show as many slides of this case as I would like, but I can only state that in the areas in which the deciduous alveolar process has not been replaced by the permanent process there is no apparent indication of any disturbance of the bone trabeculae (Fig. 10). But in the mandibular incisor region between the two permanent central incisors there is quite a marked indication of the effect of thyroid dysfunction or slow cell activity as again shown by the dark bubble-like spots marked by arrows. Please notice that at ten years of age the maxillary incisor roots have not completed their full development (Fig. 11). This case is particularly interesting in that orthodontic examination brought to light a very marked case of hypothyroidism, which if it had been allowed to continue might have created considerable havoc in the future of the child. You can be assured that the parents are very appreciative of that fact. I am holding this case in a passive state at the present time to await further eruption of permanent teeth.

MUTILATED BILATERAL DISTOCLUSION

RUSSELL E. IRISH, B.S., M.A., D.D.S., F.A.C.D., F.I.C.D., PITTSBURGH, PA.

CLASSIFICATION.—Distoclusion, Class II, mutilated.

Family History.—No tendency of biologic irregularity nor indication of pathology of reflective nature to child.

Personal History.—Male, aged eleven years. Adenoid tissue, enlarged and infected tonsils. Corrections of afore-mentioned irregularities surgically remedied.

Fig. 1.

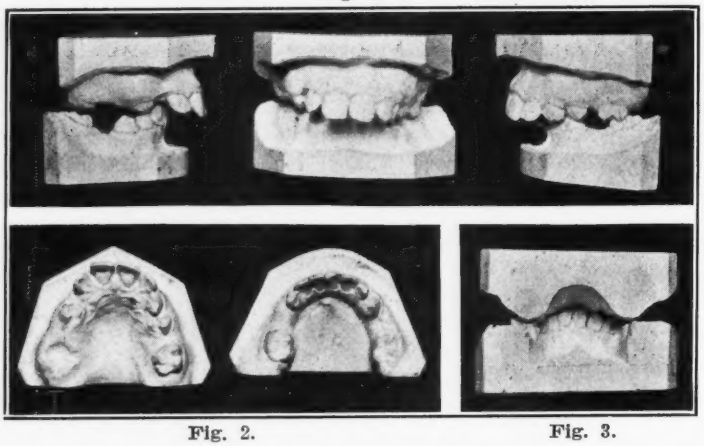

Fig. 2. Fig. 3.

Fig. 1.—Before treatment. Right side, note maxillary first molar missing and space between mandibular first molar and maxilla. Left side, note lack of space in region of second bicuspid. Note relation of maxillary to mandibular anterior teeth.

Fig. 2.—Occlusal views before treatment. Note lack of space in biscuspid region, and maxillary biscupid in torsoversion.

Fig. 3.—Models in occlusion showing lingual aspect of mandibular to maxillary anterior teeth before treatment.

General inequality in balance as follows:

A. Under weight.
B. Facial disharmony.
C. Lack of mandibular development.
D. Lack of maxillary development.
E. Basal metabolism low.
F. Inferiority complex.
G. Normal breathing impossible.
H. Nervous disposition.

Case report presented at the Thirty-Fifth Annual Meeting of the American Society of Orthodontists, Chicago, April, 1937.

History of Introduction.—

A. Posterior relation of mandibular to maxillary teeth.

B. Maxillary right first molar missing.

C. Insufficient space for maxillary second bicuspid.

D. Posterior drift of maxillary anterior teeth closing space in region of second bicuspids.

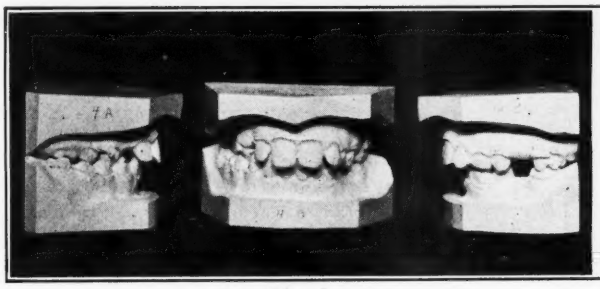

Fig. 4.

Fig. 5.

Fig. 4.—Models showing progress after one year and four months' treatment.

Fig. 5.—Left top, occlusal view of maxillary teeth before treatment. Left bottom, view after one year and four months' treatment. Note position of right second molar, right bicuspids, and space created for left second bicuspid.

Right top, occlusal view of mandibular teeth before treatment. Right bottom, view after one year and four months' treatment. Note right bicuspids in position, and space for left second bicuspid.

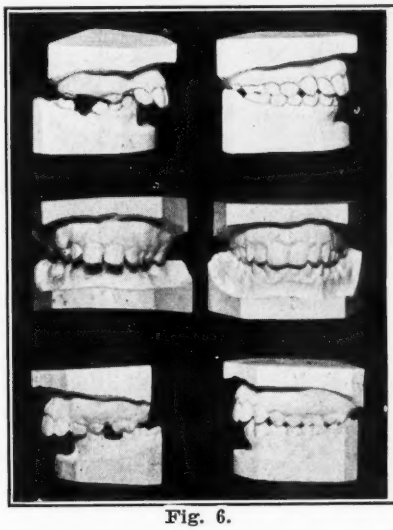

Fig. 6.

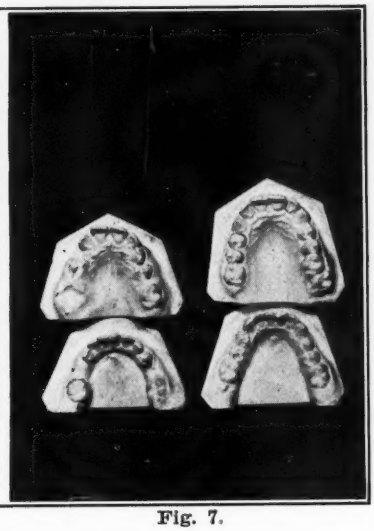

Fig. 7.

Fig. 6.—Models before and after treatment.

Fig. 7.—Left, occlusal views before treatment. Right, occlusal views after treatment.

E. Teeth occluded, permitted contact of left first molars only.

F. Right side in occlusion, no contact.

G. Occlusal plane depth, pronounced.

H. Mandibular anterior teeth, contact palate. Use of anterior teeth in incising food, none.

Remarks.—The listings under Personal History and History of Introduction clearly enumerate existing conditions. In lieu of the fact that they were rectified by treatment, a lengthy discussion in conclusion is not necessary.

However, I frankly state that conditions as listed were corrected as a result of orthodontic treatment, permitting on my part an honest expression in saying that treatment of this case was successful.

I was vitally interested in this case because of its extensiveness in disturbance, also because of the fact that several men thought it beyond treatment,

Fig. 8.

Fig. 9.

Fig. 8.—Photographs of patient before treatment. Note marked posterior relation of chin, lower lip to upper lip, and facial disharmony.

Fig. 9.—Photographs of patient after treatment. Note change in facial development as compared to pictures in Fig. 8.

either with or without the removal of teeth. Also it offered an opportunity to improve the life of one disfigured, and was a grand opportunity to afford myself and those interested an enhanced knowledge of a so-called impossibility with the thought of eventually presenting the case, hoping some good may be derived therefrom.

You will recall that it was not necessary to extract any teeth, and the end-result is pleasing.

Treatment.—Combined labiolingual technique was used throughout treatment. The appliances in every instance followed, to the most minute detail in application and construction, Oliver's technique.

Appointments.—Intervals of four weeks.

Adjustments.—Usually I found it necessary to make adjustments as per appointments over periods mentioned. There were, however, periods in which adjustments were made every other appointment.

Time of Treatment.—Two years and eight months.

612 Fulton Building.

Department of Oral Surgery

Edited by

STERLING V. MEAD AND KURT H. THOMA

Articles on oral surgery, radiography, and anesthesia should be submitted to Dr. Sterling V. Mead, 1149 Sixteenth Street Northwest, Washington, D. C. Articles on oral pathology should be submitted to Dr. Kurt H. Thoma, 47 Bay State Road, Boston, Mass.

INDICATIONS FOR BACTERIOLOGIC EXAMINATIONS OF THE MOUTH*

HENRY A. BARTELS, B.S., D.D.S., NEW YORK, N. Y.

NUMEROUS microorganisms live in the healthy as well as in the diseased mouth. Generally, these bacteria may be classified as representatives of possibly twenty or thirty species. According to Kligler[1] 60 per cent of the mouth flora is composed of cocci. Gordon[2] has found that one cubic centimeter of expectorated saliva may contain from 10 million to 100 million streptococci in addition to other organisms.

The relationship of the bacterial flora to the tissues of the oral cavity has always been a topic of interest. The dentist's clinical experience has shown that a mouth maintained in a healthy condition undergoes little, if any, observable injury by its bacterial population. If the tissue tone is lowered, however, by local factors such as lack of oral cleanliness, food impingement, pyorrhea pockets, overhanging fillings, poorly constructed bridgework or tartar accumulations; or if the tissue tone is lowered by such systemic disturbances as diabetes, blood dyscrasias, endocrine imbalance or faulty metabolism, then the environment of the oral cavity becomes suitable for the proliferation of some of its inhabitants. Under such conditions we may note various lesions in the mouth, the pathologic pattern of which may vary according to location, extent, inciting agent or agents, and the resistance of the tissues.

I wish to present to this association some of the indications for bacteriologic examinations of the mouth, particularly such as may be observed in the office of the general practitioner.

DENTURE SORE MOUTH

Recently Doctor Cahn[3] and I[4] have called attention to the fact that denture sore mouth is not always due to a poorly fitting denture. Patients whom we examined complained of a burning painful sensation beneath the dentures

*From the Department of Oral Pathology, School of Dental and Oral Surgery, Columbia University, New York City.

Read at the Meeting of the Association for the Advancement of Oral Diagnosis, July 12, 1937, Atlantic City, N. J.

they were wearing. In some instances these dentures had been worn satisfactorily for months or years, while in others they had been inserted recently. The dentures appeared to fit correctly and the occlusion seemed to be balanced. Usually a zone of redness varying from a spot a centimeter in diam-

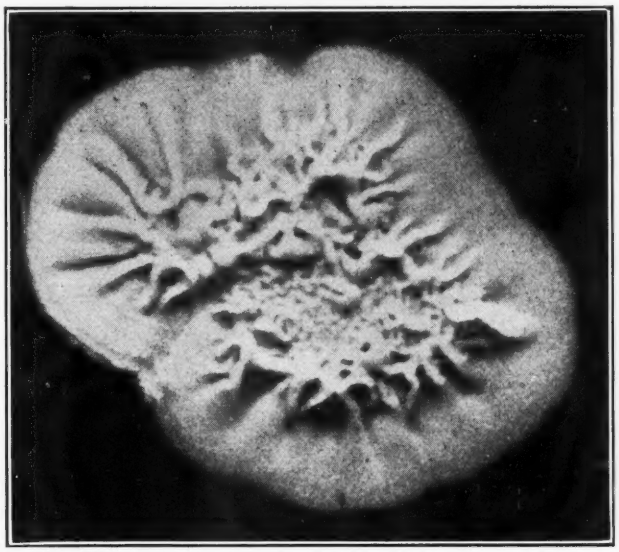

Fig. 1.—Monilia albicans. Giant colony about six weeks old. Sabouraud's medium.

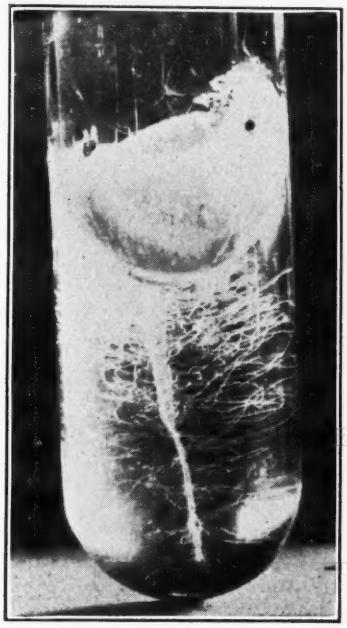

Fig. 2.—Monilia albicans. Mycelium with yeast cells attached. Corn meal agar.

eter to an area corresponding to the imprint of an entire partial or full denture was evident. At times there were also white patches that could easily be peeled off the surface of the tissue. Ulceration was not noted. The histologic examination revealed an atrophied degenerated epithelium. In-

flammation was present in the subepithelial zone of the corium. The picture was one of chronic inflammation probably produced by a toxic irritant.

Material was scraped with a sterile loop from the reddened areas or white patches and inoculated on Sabouraud's medium, honey agar, blood plates, and in glucose infusion broth. Portions of the material were also examined microscopically in moist preparations with 10 per cent potassium hydroxide and in smears stained by Gram's method and with aqueous gentian violet. The palatal and the mandibular surfaces of the dentures were rubbed and examined in a like manner.

In such films yeastlike cells, mycelium, cocci and epithelial cells were noted. Culturally a *Monilia albicans* was isolated. Attempts to induce with it lesions in the mucous membrane of the mouths of rats and rabbits were unsuccessful; although intravenous injection in some instances caused death

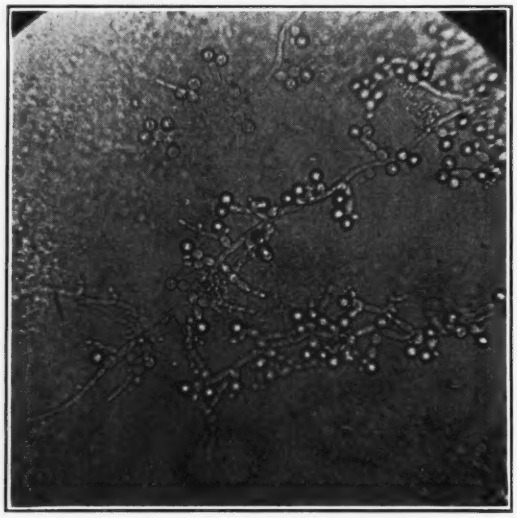

Fig. 3.—Monilia albicans. Growth in gelatin, two months. Mycelial filaments radiating from the stab.

of the animals in several days. Autopsy of the dead animals showed miliary abscesses in the cortex of the kidney.

The presence of monilia in the apparently normal mouth, throat or vagina has been reported by various observers.[5, 6, 7] It would appear that yeastlike organisms may inhabit the normal mouth without giving rise to pathologic lesions. However, when the tissue tone is lowered due to either local or general disturbances, infection may occur. The wearing of dentures may affect the mucous membrane of the mouth in some individuals, lowering its tone. Dentures also afford mechanical protection for the yeastlike organisms against the action of saliva and the friction of the food bolus, and may induce a condition of dryness of the mucous membrane which favors the growth of these organisms.

Treatment has consisted of swabbing the areas with 5 per cent aqueous gentian violet, and the patient is instructed to keep the dentures clean by

placing them into a mild hypochlorite solution at night. No trimming of the dentures was done or any attempt made to relieve the bite. Recovery was rapid, generally within a week.

It is important to emphasize, however, that not all cases of denture sore mouth are due to infection by yeastlike organisms. The condition is more often the result of poorly fitting dentures, improper bite, or the idiosyncrasies of patients toward the materials contained in the dentures.

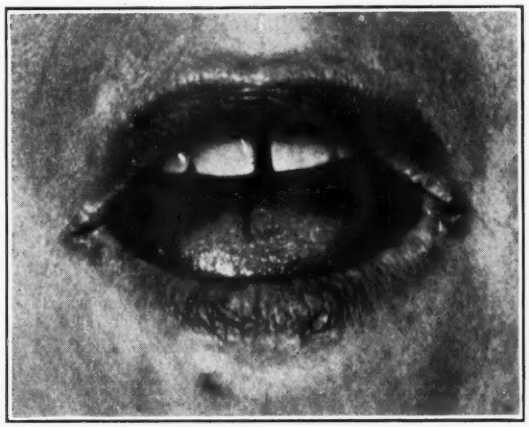

Fig. 4.—Perlèche. Monilia infection at commissures of mouth. (Figs. 4, 5, 6, 8 from the collection of A. H. Montgomery, M.D., New York City.)

Fig. 5.—Monilia infection of interdigital space.

PERLÈCHE

Another lesion considered to be caused by yeastlike organisms is perlèche, found at the commissures of the mouth. At one time this condition was thought to be due to a streptococcus, but now evidence indicates that the incitant is a member of the monilia group. Finnerud,[8] who studied 100 cases among children in an institution at Chicago, describes the lesion thus:

"Earliest lesion consists of a somewhat ill defined, barely visible, smooth, grayish white thickening in an area the size of a pinhead or larger, on the mucous membrane side of the mucocutaneous junction of the commissure of the lip, and a slight erythema extending 1, 2, or 3 millimeters along its cutaneous side. As the lesion develops, it gets a mother-of-pearl-colored thickening about the size of a match head. Often fissures develop on the skin portion. Bleeding rarely occurs unless the area is traumatized." Individuals so afflicted seldom complain of pain, but they experience a sensation of dryness in the area. No ulceration develops. Closure of the bite may be a factor in its production, forming an exaggerated fold of the lips similar to

Fig. 6.—Monilia infection of the feet.

an intertriginous area. Scrapings from these lesions may reveal the yeast-like organisms. Inoculation of Sabouraud's medium or other similar media will give growth of monilia. Finnerud[8] inoculated the scarified commissures of 10 children and produced the lesions in nine instances. Two controls who were only scarified remained normal.

Treatment with gentian violet or in edentulous adults insertion of dentures or raising the bite may eliminate the condition.

PYORRHEA

At the present time no definite microorganism is known to be the incitant of pyorrhea, and it is possible that organisms play only a secondary

rôle in this disease. They must, however, be given consideration since the pyorrhetic pocket affords an excellent environment for their growth. In these areas we have a break in the continuity of the dental system, and such pockets in my estimation afford better sites for foci of infection than the granuloma or root end cyst. Repeated film examinations of exudate from such areas serve as an index to the progress of treatment. Recently a woman, aged thirty-five years, came to the office with the following history. She had been informed by her dentist that he could do nothing for her pyorrhetic condition, and he referred her to a nose and throat specialist. The latter stated that the spirochetes could be eliminated from the gingiva by intravenous injections of arsphenamine. The patient had six injections, and no clinical improvement was noted. I was interested to observe just what effect the six injections had on the spirochetal flora, so I made film preparations of some of the exudate of the pockets. A large number of spirochetes were present. (See Fig. 7.) It is also evident in luetic conditions where the treatment has been continued until a typical Burtonian line or a gingivitis

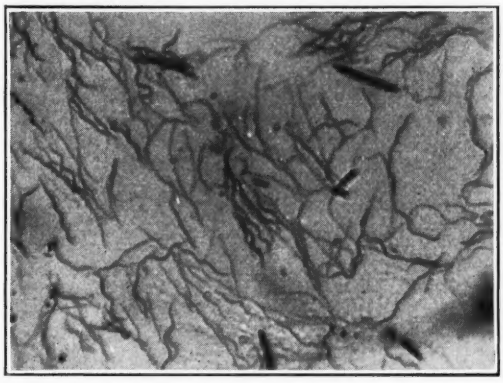

Fig. 7.—Spirochetes present in pocket about tooth in a patient who had had six intravenous injections of arsphenamine to eliminate these organisms.

develops that many spirochetes may be present. At any rate I scaled the patient's teeth, curetted the pockets gently and then injected 5 per cent aqueous gentian violet into them. The patient left town for two weeks, and on her return I took another smear, scraping the root of one of the larger pockets. Many amebas and leucocytes were present. The area was again treated by injection of gentian violet and curetted. Twenty-four hours later another film was prepared. The number of amebas had diminished but the leucocytes were still present in large number. Five days later no amebas or leucocytes were observed, and the bacterial flora was approximating that of the normal mouth. Another smear taken from the same area several weeks later showed the same normal mouth flora. The patient in the meantime had been massaging the gums and performing toothbrush stimulation. The gingiva about the pocket had lost its inflammatory appearance and had assumed a light pink tone. I believe the smear furnishes a criterion as to the progress of the treatment. Change in the environment of the pocket due to scaling and the use of gentian violet had rendered the area unsuitable for the growth of the ameba. Diminution in leucocytes indicates that the treatment has removed

the cause of the inflammation. In cases in which no change in the number of leucocytes or amebas or spirochetes is noted, the findings indicate that the response to treatment is poor.

VINCENT'S INFECTION

Numerous examinations of film preparations of material scraped from the gingivae for presence of fusospirochetal organisms have been made. Today we can definitely state that the mere presence of these microorganisms does not signify Vincent's infection. They are found in variable numbers in a large number of mouths. Complete dependence on smear diagnosis together with a lack of knowledge concerning these organisms and their environmental habitats has led in some instances to the diagnosis of Vincent's gingivitis when the condition has been due to other factors. In other cases treatment is prolonged because these organisms cannot be eradicated, although clinically the case is apparently normal.

Examination of sufficient bacterial films taken from various areas of the oral cavity in both healthy and diseased mouths, of individuals of various ages, will indicate that the spirochetes and the fusiform bacilli are found in many of such films. The areas in which they occur most frequently and in large numbers are those in which accumulations of débris, necrosis of cells, or inflammation occur. Therefore their presence in large numbers is an excellent criterion that the area from which the smear was made is not in a normal condition and yet does not necessarily indicate that the patient has a Vincent's infection. The relative number affords some index as to the oral health of the site examined.

Recent evidence tends to indicate that Vincent's infection is incited by a combination of several organisms. According to D. Smith[9] four organisms make up the inciting complex. These are a vibrio, an anaerobic streptococcus, a fusiform bacillus, and a spirochete. More recently Proske and Sayers[10] in studies on the etiology of lung abscesses in stone workers confirm Smith's findings.

I recall a Vincent's infection in one of my patients. Under sodium perborate treatment the patient responded well for several days and then no further progress occurred. Original smears showed many spirochetes and fusiform bacilli and some cocci. A large number of hemolytic streptococcus colonies grew on blood agar plates. When the patient no longer responded to treatment, further smears showed numerous cocci and leucocytes and an absence of the fusospirochetes of Vincent. The cultures again showed many hemolytic streptococcus colonies. I changed the treatment to 5 per cent gentian violet, and in a few days the symptoms subsided and the hemolytic streptococci disappeared. Here again attention is called to the value of bacteriologic examinations in giving information during the course of treatment.

ULCERS

The occurrence of ulcers in the oral cavity is noted frequently. They may be caused in different ways. The excursions of the tongue against a jagged tooth or the friction of a denture results in the production of the so-called

traumatic ulcer. Abrasion of the mucous membrane by coarse or sharp food particles may be sufficient damage to furnish an area the environment of which is suitable for colonization by some of the mouth flora, and so the mechanical injury is aggravated by the microbic metabolic activities.

Herpetic ulcers and possibly aphthous ulcers are induced by the activation of filtrable viruses which may remain dormant in the host between the appearance of individual or crops of ulcers. Upsets due to faulty metabolism or endocrine disturbances tend to change the tissue tone of the mucous membrane and so render it more prone to attack.

Material obtained from such ulcers on bacteriologic examination shows the presence of various organisms such as streptococci, diphtheroids, spirochetes, bacilli and Gram negative cocci. Their significance is questionable. Are they to be considered primary incitants, secondary invaders, or opportunists proliferating in a favorable site? Here indeed is a fertile field for investigation. After numerous ulcers are examined bacteriologically, by culture under aerobic, anaerobic and partial carbon dioxide tension, and the organisms thus obtained inoculated into the scarified mucous membrane of animals, then data will be accumulated which will be of value in deciding the specific importance of the bacterial inhabitants of such areas.

The ulcers just mentioned are generally small and painful and are surrounded by a zone of inflammation. With the elimination of the cause of trauma or through the proper remedial measures they heal rapidly and disappear within a few days to a week.

There are, however, several types of ulcers which persist for long periods of time. Ulcers should be viewed with suspicion if still present after several weeks and their cause still undetermined. Such lesions may be cancerous in nature or due to the syphilitic spirochete, the tubercle bacillus and in some instances to actinomyces. If small, such ulcers are difficult to diagnose by simple observation. Bloodgood[11] stated, "As a rule in the mouth no matter where the ulcer is, it is a dangerous thing to make a diagnosis on gross appearance only."

SYPHILIS

Syphilis may occur in or about the mouth in a variety of pathologic patterns depending on the stage of the disease and the location of the lesion. Zinsser[12] writes that secondary syphilis has a peculiar predilection for the mouth due to its constant irritation by such agents as tobacco, food, and hot drinks. The secondary manifestations are generally limited to the mucous membrane, and the tertiary lesions involve the bones and muscles. Fournier according to Zinsser gives statistics on the location of 1,124 extragenital chancres; 849 of these were located on the head as follows: lips 567, tongue 75, tonsils 69, gums 11, and mucous membrane of the cheek 1.

There are two methods of investigation at our command. The dark-field examination of the exudate of the lesion and the complement fixation or precipitation tests performed with the patient's serum. The dark-field examination of lesions of the mouth is beset with difficulty and should be performed

only by an experienced and capable bacteriologist. The Division of Laboratories and Research of the New York State Department of Health states,[13] "Owing to the presence in the mouth of nonpathogenic species of spirochetes, some of which closely resemble the *Treponema pallidum* in morphology, it is seldom wise to undertake the laboratory examination of material from lesions occurring in the mouth or throat."

During the primary stage the complement fixation test (Wassermann) is of little value until a period of two to four weeks has elapsed since the occurrence of the lesion. Kilduffe[14] records that after the second week approximately 60 per cent of blood specimens are positive; after four weeks 75 per cent; five weeks 80 per cent; later 90 per cent. In secondary syphilis blood from untreated cases is generally positive in 100 per cent of cases if the test is correctly performed. Treated cases give positive results in 85 to 90 per cent of instances. However, a definite proportion may react only to the cholesterinized antigen. Untreated active tertiary cases are positive in over 90 per cent, and approximately 70 to 85 per cent of treated cases cause fixation of the complement.

Recently I had an interesting patient visit the office. She was a woman about fifty years of age who had been wearing dentures for ten years. She informed me that two years previously her mouth began to pain in the region of the tuberosities. She went to the family physician who without examining her mouth prescribed a mouth wash. The pain persisted on and off, and finally she came to the office. Examination revealed a peculiar purplish reddish area extending over both tuberosities forward to about the first molar region, centrally to the palatine foramen and buccally to the mucobuccal fold. No ulceration was noted. At first it was thought that this was a case of pressure irritation, and the patient was advised to leave her denture at the office and return one week later. When her mouth was reexamined at the next visit, it showed no improvement. The patient's blood was tested and gave a two-plus reaction. The woman received a course of bismuth and iodides. A biopsy was also performed on a portion of the tissue and was reported inflammatory tissue with a preponderance of plasma cells. Under antiluetic treatment the purplish discoloration gradually disappeared after a period of six weeks. A luxene denture was then made for the patient, since it was thought that possibly settling of the old denture on an area of lowered tissue tone may have acted as the local factor in producing the lesion. The patient was observed at monthly intervals and the mucous membrane remained normal for six months. Later the patient returned again showing discoloration over the same areas. The blood was again tested and found to be four-plus by the Kahn precipitation method and two-plus with the complement fixation test. Antiluetic treatment has again been started and the purplish color is again fading away.

ACTINOMYCOSIS

Actinomycosis, while relatively infrequent, occurs more often than is generally suspected. At least 50 per cent of all actinomycotic lesions develop about the face or neck. Usually the mandible is more prone to infection, but the

tongue, floor of the mouth, maxilla and antrum may also be involved. In this disease an important clinical observation is that the regional lymph glands are generally not enlarged.

Only a slight swelling may occur at first, which is symptomless and so not noticeable to the patient. The swelling eventually forms a nodular mass from which pus may exude. The lesion consists of a peripheral zone of granulation tissue surrounding a central abscessed area. Within the latter portion are found filaments of the inciting organism. With the accumulation of pus, burrowing begins, and finally the exudate reaches the surface of the skin or

Fig. 8.—Actinomycosis. Patient had some teeth extracted about one month previous to formation of lesion. Improved under treatment with iodides.

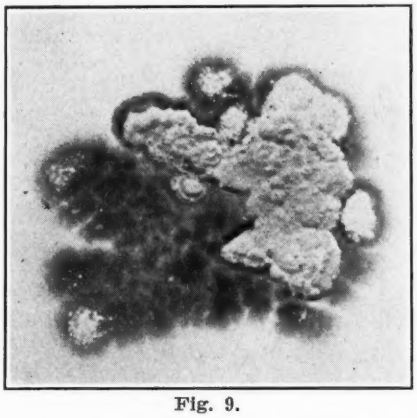

Fig. 9.

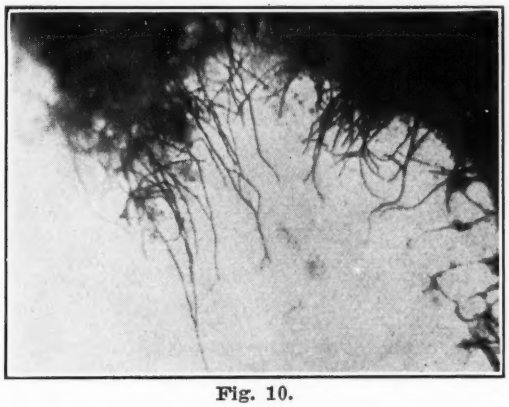

Fig. 10.

Fig. 9.—Colony of an aerobic actinomycete. Darker portion consists of filaments penetrating into agar.

Fig. 10.—Film preparation of portion of colony shown in Fig. 9, penetrating into agar.

mucous membrane via fistulous tracts. Closure of one tract is soon followed by formation of another in close proximity. The pus contains the sulphur granules which when gently squashed between slides reveals, by their arrangement, the typical ray fungus. However, in some instances the clubbed ends are not present and the radial formation of the filaments is absent, and examination may show only disjointed filaments. It is wise to spread the pus in a Petri dish and with the aid of a hand lens search for granules which vary in color from yellow to gray and in size from a pinpoint to that of a

pea. After a granule is found, it should be gently washed in sterile saline solution, and then squashed between a slide and cover slip. Granules are not always present, and it may be necessary to irrigate the fistulous tract with saline solution and examine the washings for granules. If no granules are found, repeated examinations should be made at various times before this possible incitant is eliminated as the probable cause of the lesion.

The old idea that lesions develop only in individuals who have been in contact with animals or vegetable matter does not seem warranted since at least 50 per cent of actinomycosis cases give no such history. Since the actinomyces isolated from lesions are anaerobic or microaerophilic, that is, grow best at first under anaerobic conditions, and since those found on vegetable matter are aerobic and apparently harmless on animal injection, it would seem that this old conception must be modified.

Recently Lord[15] and also Emmons[16] have reported on the presence of actinomyces in the mouths and tonsils of individuals showing no indication of

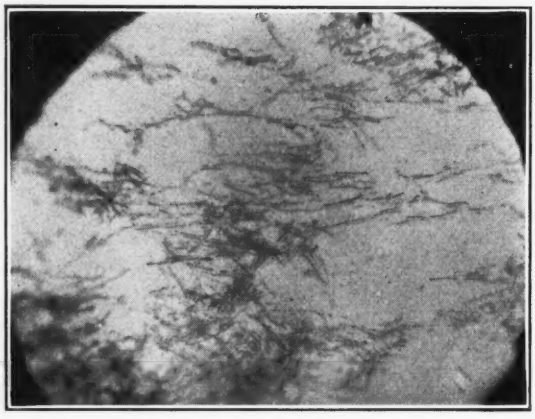

Fig. 11.—Film preparation of an anaerobic actinomycete which had grown in chopped meat medium. The filaments are easily fragmented. At times only bacillary forms may be noted. These may resemble diphtheroids.

actinomycosis. When such organisms were injected into animals, nodules developed. Lieske[17] believes that the aerobic form is best adapted for saprophytic life while the anaerobic form develops best under parasitic conditions. Lieske claims he has been able to get transitions from aerobic to anaerobic and from nodule forming and short filaments to long filaments in the same species. Possibly here is some evidence that saprophytic aerobic species may through variation in the oral cavity adapt themselves to parasitism by changing to an anaerobic type of existence. However, in view of Lord's and Emmons' findings it would seem more logical to believe that the mouth harbors anaerobic actinomyces in some normal individuals and that with injury the organisms gain access to the tissues and form lesions. Thoma[18] cites an instance of finding actinomyces in the root canal of a tooth and believes this route is a means of ingress in infections of bone.

Several cases of interest have come to my attention. One was a man who developed an osteomyelitis subsequent to a fracture of the mandible. After some months of treatment, no improvement was evident. A consultant was

called in, and he suspected actinomycosis. Pus was sent to three laboratories for confirmation. Two reported no actinomyces found. The third reported the finding of actinomyces. Some of the granules were cultured in chopped meat infusion broth, and after one month growth was obtained in the form of nodular masses which when squashed between slides gave the appearance of filaments and at other times appeared as small bacilli resembling diphtheroids. The organism was lost in subculturing. The patient improved under iodide treatment.

Another case is that of a colored man visiting the Vanderbilt Clinic. Two years previously, this man had extracted a maxillary left bicuspid tooth himself. Since this self-extraction he had suffered from headaches, nasal obstruction and frequent colds. Examination revealed the gingiva in the region of the maxillary first molar to be necrotic and ulcerated, and a fistula was present leading to the antrum. The Wassermann test was four-plus and the

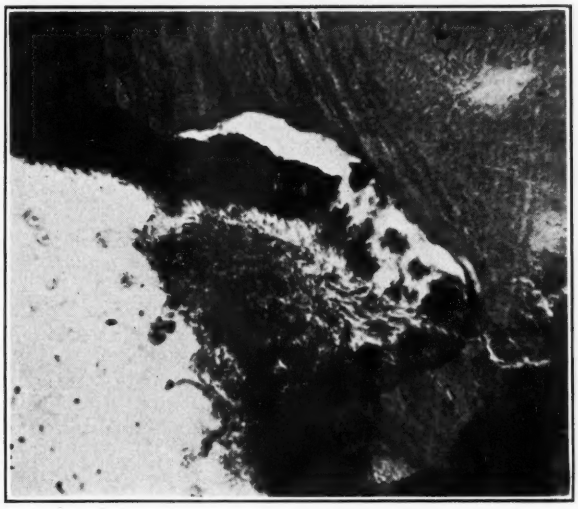

Fig. 12.—Section of a sequestrum from a case of actinomycosis involving both the antrum and the mandible. Note radially arranged layer of actinomyces about edge of bone trabeculae.

patient admitted having a chancre twenty years ago. No improvement was noted under antiluetic treatment. Biopsy of the left maxillary alveolar bone in the region of the first molar showed the alveolus to be composed of necrotic, porous, foul smelling bone which appeared to be sequestrated and to extend up into the remains of the left maxillary sinus. Sections showed cancellous bone with some irregularity in staining and with a pink lamellated structure predominating. Certain areas were found to have a sharp transition to an acellular granular material staining a faint purple. Other areas showed a distinct irregular lysis of the bone due to pressure. In several places small clusters of radially arranged masses were seen which resembled actinomyces. Subsequently the patient developed a lesion in the lower left mandible with formation of a sequestrum. There was found to be a large opening through the mucous membrane exposing the sequestrum. Sections of the sequestrum showed motheaten trabeculae of dead bone between which were seen masses

of granular débris. Many of the irregular trabeculae were intimately surrounded with a radially arranged layer of actinomyces. A few clumps of the actinomyces were seen between the trabeculae.

In this case we had an actinomycosis superimposed on a luetic base. Infection was no doubt due to the actinomyces present in the man's mouth, which subsequent to the extraction of the tooth entered the zone of trauma.

SUMMARY

In this paper I have attempted to direct attention to the value of laboratory examinations and to emphasize their place in some of the conditions which the dentist is called on to diagnose and treat.

REFERENCES

1. Kligler, I. J.: A Biochemical Study and Differentiation of Oral Bacteria, J. A. D. A. **10**: 141, 282, 445, 1915.
2. Andrewes, F. W.: Evolution of Streptococci, Lancet **2**: 1415, 1906.
3. Cahn, L. R.: The Denture Sore Mouth, Ann. Dent. **3**: 33, 1936.
4. Bartels, H. A.: The Significance of Yeast-Like Organisms in Denture Sore Mouth, Int. J. Orth. & Oral Surg. **23**: 90, 1937.
5. Tanner, F., Lampert, E. N., and Lampert, M.: On the Presence of Yeast-Like Fungi in Normal Throats, Centralbl. f. Bakt. **103**: 94, 1927.
6. Benham, R.: Fungi and Their Pathogenicity (Chapt. 45, p. 1118) in Gay's Agents of Disease and Host Resistance. Published by Thomas, Baltimore, Md., 1935.
7. Henrici, A.: Molds, Yeasts and Actinomyces, New York, 1930, John Wiley & Sons, Inc.
8. Finnerud, C.: Perlèche: A Clinical and Etiologic Study of One Hundred Cases, Arch. Derm. & Syph. **20**: 454, 1929.
9. Smith, D.: Oral Spirochetes, Baltimore, 1932, Williams & Wilkins Co.
10. Proske, H., and Sayers, R.: Pulmonary Infection in Pneumoconiosis, U. S. Pub. Health Reports **49**: 839, 1212, 1934.
11. Bloodgood: Ulcers of the Oral Cavity and the Tongue, Int. J. Orth. & Oral. Surg. **18**: 993, 1932.
12. Zinsser, F.: Diseases of the Mouth, New York, 1912, Rebman & Co.
13. Wadsworth, A.: State Department of Health, Division of Laboratories and Research Laboratory Manual, p. 75, Albany, N. Y.
14. Kilduffe, R.: Clinical Interpretation of Blood Examinations, Philadelphia, 1931, Lea & Febiger.
15. Lord, F.: The Etiology, Pathogenesis and Diagnosis of Actinomycosis, M. Clin. North America **16**: 829, 1933.
16. Emmons, C.: Strains of Actinomyces Bovis Isolated From Tonsils, Puerto Rico J. Pub. Health & Trop. Med. **11**: 720, 1936.
17. Lieske: Quoted by Lehmann, K., and Neumann, R.: Determinative Bacteriology, New York, 1931, Stechert & Co.
18. Thoma, K.: Clinical Pathology of the Jaws, Baltimore, 1934, Charles Thomas.

MALOCCLUSION CAUSED BY MACROGLOSSIA

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THE tongue is an active, powerful, muscular organ. It aids in the function of swallowing, speech and mastication. When not active it rests in the floor of the mouth, the margins and apex resting lightly against the lingual surface of the mandibular teeth.

If, however, the surrounding and adjacent structures are abnormal, such as enlarged adenoids and tonsils, contracted dental arch, extreme malposition of the teeth and growths of the floor of the mouth, the tongue is shifted from its normal position and therefore may from its abnormal position force the adjacent structures to the tongue to become malformed. Eruption of the teeth may be delayed, malocclusion may become more fixed and mouth-breathing becomes more pronounced. As time goes on during the period of growth, a vicious circle becomes firmly established so that the normal function of the nose, palate, teeth, jaws and the temporomandibular articulation is out of balance.

Naturally under such a morphologic manifestation it is discouraging to depend on any one form of treatment for the correction of such a generalized malposition involving the dento-naso-facial area in order to obtain a normal functional and anatomical result.

The tongue, though normal in its formation, may from its abnormal position be the cause of malocclusion and malrelation of the dental arch as well as jaw malformation. Orthodontists should be quick to recognize the development of the abnormal position of the tongue caused by enlarged and diseased tonsils and adenoids, nasal polypi, deflection of the septum, hyperplasia of the turbinates, etc. It is such pathologic manifestations that change the normal position of the tongue, and with this malposition comes malfunction of the adjacent structures.

In this paper I wish to call attention to the malrelation of the teeth from an abnormal size of the tongue and tongue malposition.

Dermoid cysts are congenital in origin caused by the inclusion of the epiderm within the tissues formed from the mesoderm. They are usually formed in the generative organs, but may be found in various parts of the body. The linings consist of stratified epithelium containing dermoid elements such as hair, skin, teeth, nails, sebaceous matter and more often a thick, creamy, yellowish fat.[1]

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Dermoid cysts, as a rule, are not noticeable at birth or in the young. They may exist through life and give little or no inconvenience; however in their growth they may displace adjacent structures so as to impair function.[2] When found in the floor of the mouth, they occur in one of two situations, in the midline beneath the skin between the geniohyoglossi muscles or laterally below the angle of the jaw.[3]

I wish to report the following case.

Miss C., colored, housemaid, aged twenty-five years, complained of a large swelling beneath the tongue. She had noticed a swelling in this region for about ten years. She felt no inconvenience except that she had noticed that the mandibular teeth were gradually separating, and later she experienced con-

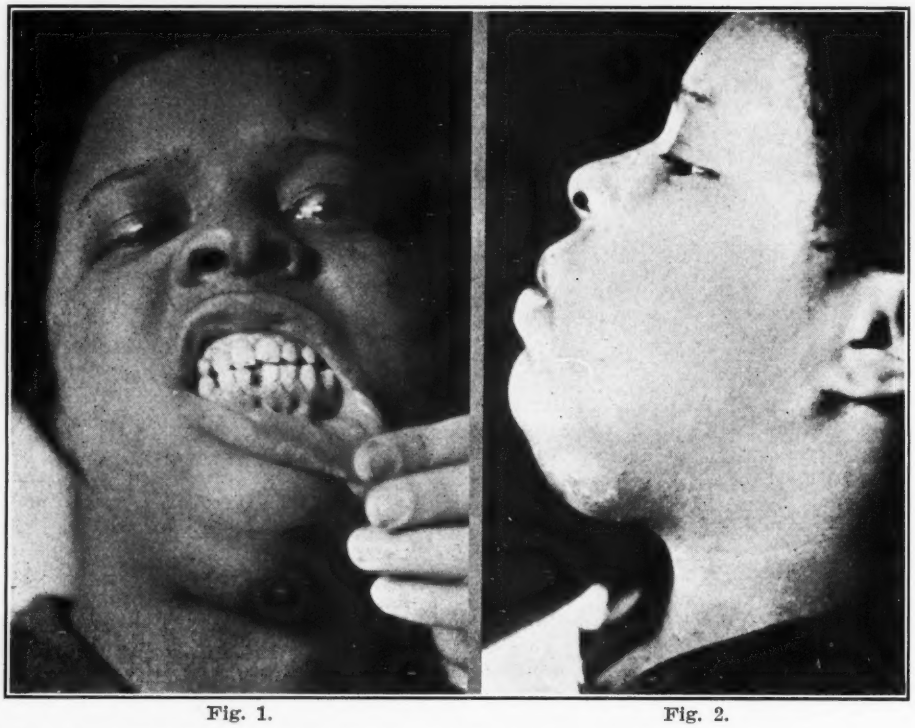

Fig. 1. Fig. 2.

Fig. 1.—Separation of mandibular teeth caused by macroglossia.
Fig. 2.—Case of macroglossia. Notice bulging beneath floor of mouth.

siderable difficulty in swallowing, and it was necessary to keep her mouth open to permit the tongue to come forward so that she could breathe more freely.

Examination.—Within the oral cavity the swelling was found to be protruding above the floor of the mouth so that the tongue appeared to be crowded into the pharynx. When she closed her mouth the swelling would shift downward, and project below the floor of the mouth close to the hyoid bone. She talked with much difficulty, and breathing was somewhat interfered with unless she kept the mouth open. The teeth appeared to be quite free from caries. There was a distinct separation between the mandibular incisors, and the teeth showed signs of being tipped out of alignment (Figs. 1 and 2). On palpating

the floor of the mouth, I could detect a doughy feeling within the mass which in itself was movable. The patient had been losing in weight because she found it rather difficult to swallow solid food.

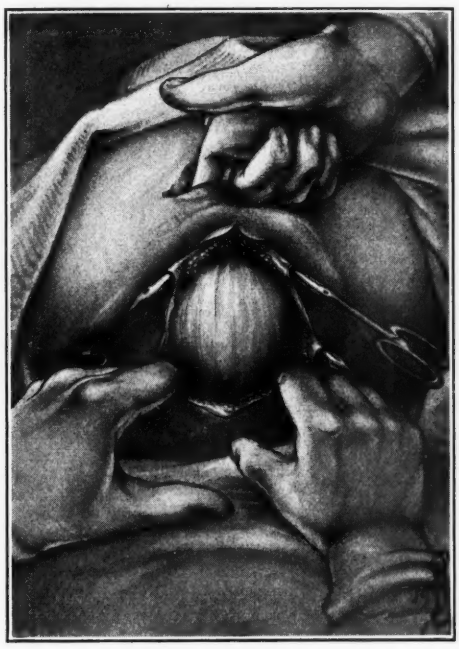

Fig. 3.—Exposing growth through midline incision.

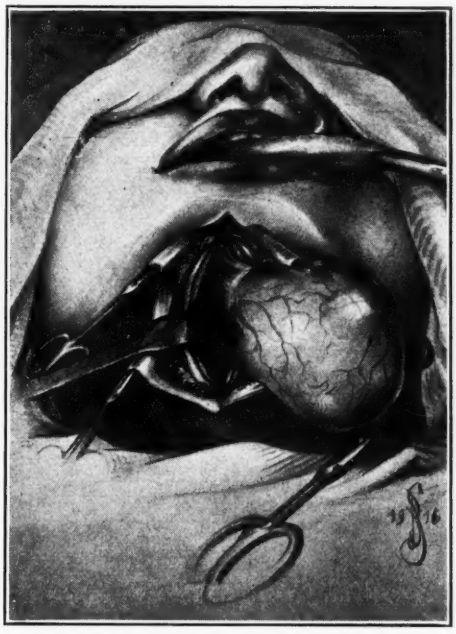

Fig. 4.—Dermoid cyst lifted out of its bed.

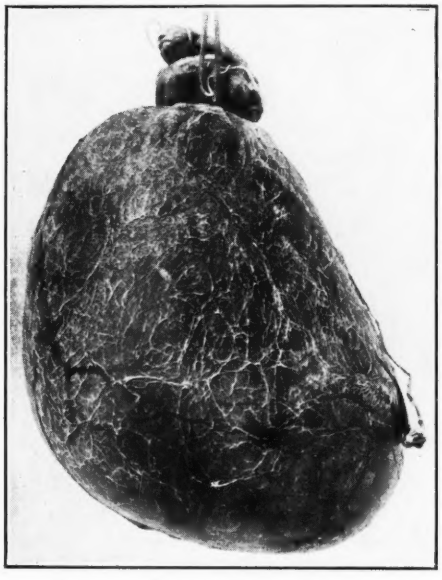

Fig. 5.—Dermoid cyst removed.

The tentative diagnosis was a dermoid cyst. She was operated on at Trinity Hospital. An incision was made about four inches in length in the midline from the chin toward the hyoid bone. The geniohyoid muscles were separated by

drawing the tongue forward and applying pressure on it. This forced the tumorous growth through the opening as is indicated in Fig. 3. The mass was gently dissected out as is illustrated in Fig. 4. The muscles were then brought to normal position, and the wound was sutured.

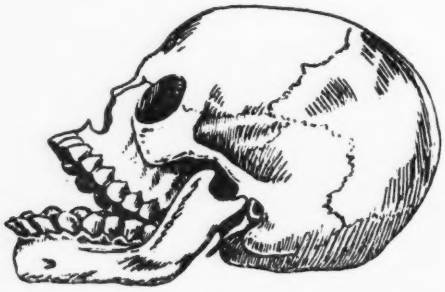

Fig. 6.—Malformed jaw caused by malocclusion. (From Fitzwilliams.)

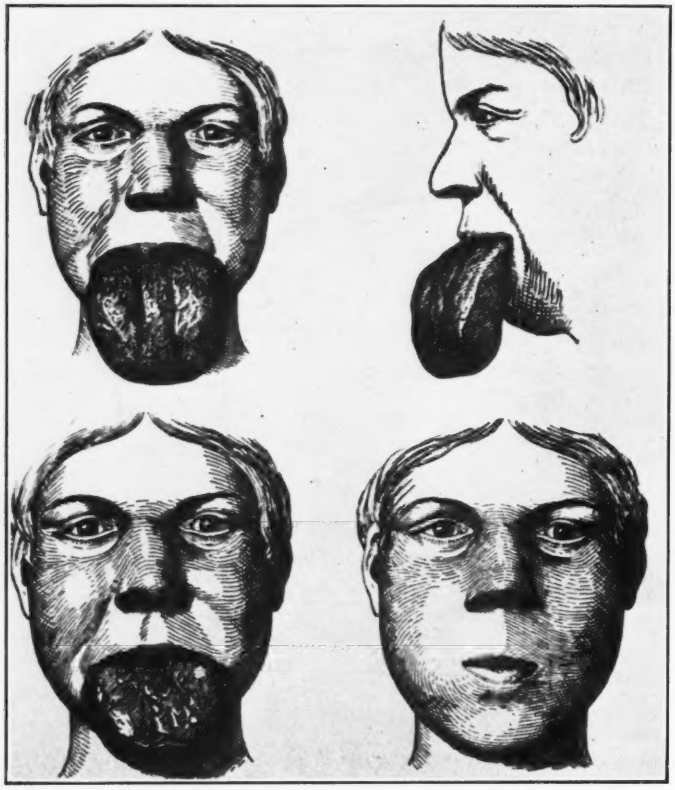

Fig. 7.—Four wax models of a case of macroglossia.

A laboratory examination of the mass (Fig. 5) proved it to be a dermoid cyst consisting of a fibrous capsule lined with stratified epithelium and containing a soft cheesy material.

Macroglossia has been described as the tongue of an adult protruding from the mouth of an infant. There are two well-recognized conditions. One is an enlargement of the lymphatic spaces, and the other muscular macroglossia.

As the tongue enlarges, the teeth separate; and, when attempts are made to close the mouth, there is a distinct bulging beneath the chin. The enlargement of the tongue appears to be an enlargement of all its parts so that each papilla is larger than normal and, as the tongue becomes more and more protruding, the margins become more of a dark color, dry, covered with crusts and numerous

Fig. 8. Fig. 9.

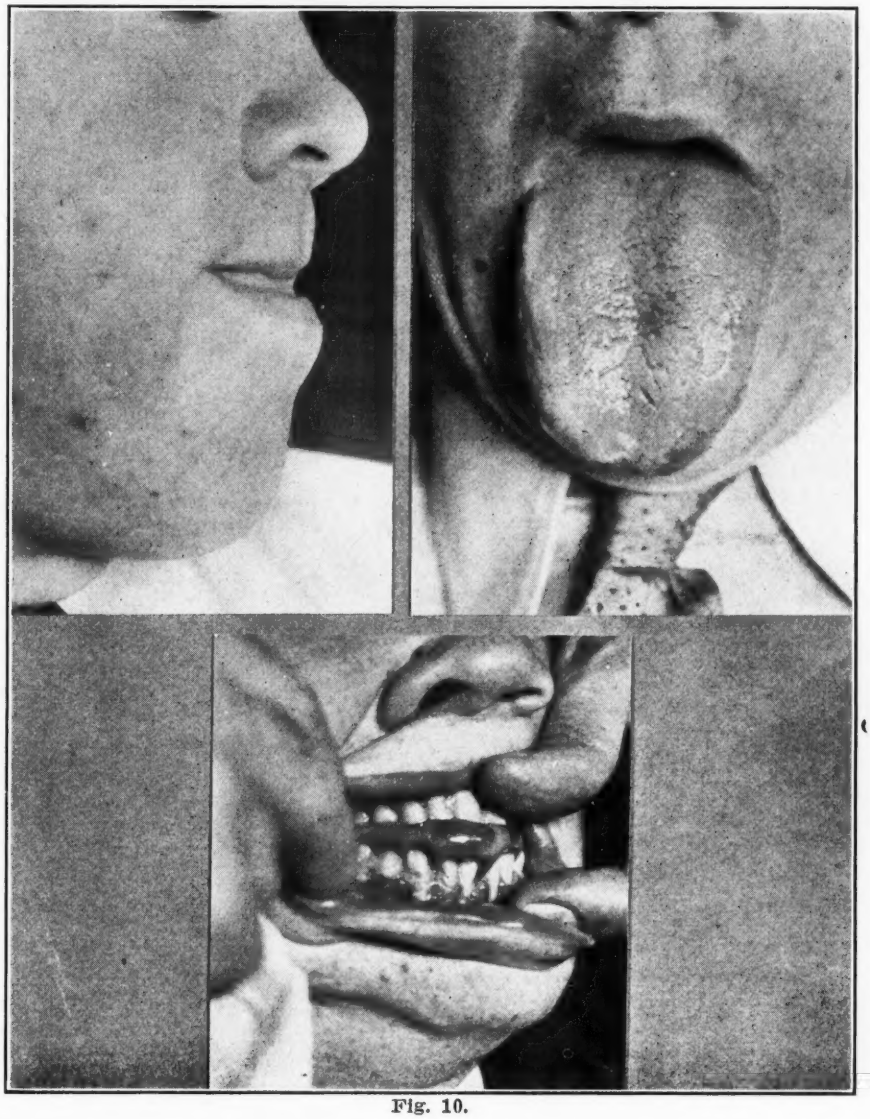

Fig. 10.

Fig. 8.—Lower lip protruding from pressure of enlarged tongue.
Fig. 9.—Case of macroglossia.
Fig. 10.—Showing lack of room between dental arches for enlarged tongue.

ulcers. The teeth are in malposition and the jaws malformed as is illustrated in Fig. 6.

This is the skull of a girl, aged ten years, preserved in the Wurzburg Museum. She suffered from macroglossia. The tongue was removed by ligature

by Von Siebold in 1791. The slough separated on the twenty-fourth day. She died of septicemia on the twenty-seventh day.[4]

When the lymphatics are enlarged or so-called lymphangiomatous macroglossia, there is a sponge-work of lymphatic vessels. This is sometimes confined to one side of the tongue or to the anterior half of the tongue and may remain so for a long time. It is a condition that is usually congenital, but there are cases on record in which an injury has been the cause of this condition.

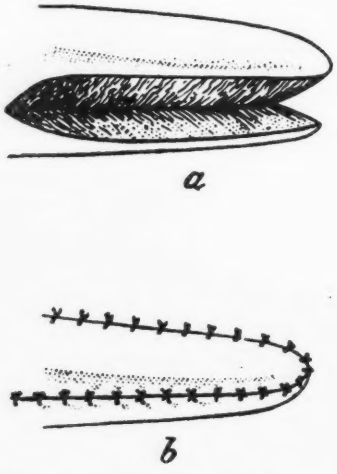

Fig. 11.—Schematic drawing to illustrate marginal resection of the tongue.

Fig. 12.—Showing amount of tissue removed from margin of tongue.

Muscular macroglossia is a parenchymatous enlargement of the tissue of the tongue. It is said to be associated with other hypertrophies and malformations as is mentioned by Fitzwilliams. He reports that it may be associated with enlargement to one side of the body, one arm or one side of the head. The condition is supposed to be congenital. It is not dangerous to life. The patients have no complaint to offer except that a noticeable change in the position of the teeth takes place and the friction of the tongue against the

teeth produces numerous ulcerations which may develop into a pronounced inflammatory condition. Speech becomes difficult and sometimes the lip appears to protrude because the tongue rests between the incisal edges of the teeth and pushes the lower lip forward.

Fig. 7 shows four wax models of a case of macroglossia from the Pathological Museum of the University of Edinburgh. This illustration shows clearly how extensive a tongue may become. There is no report in this case regarding the malformation of the teeth or jaws; however one can notice the fullness of the lip when the mouth is closed.

The next case is that of a young man, eighteen years of age, who was under my care. He had a typical muscular macroglossia. Fig. 8 shows the mouth closed permitting the tongue to rest between the maxillary and mandib-

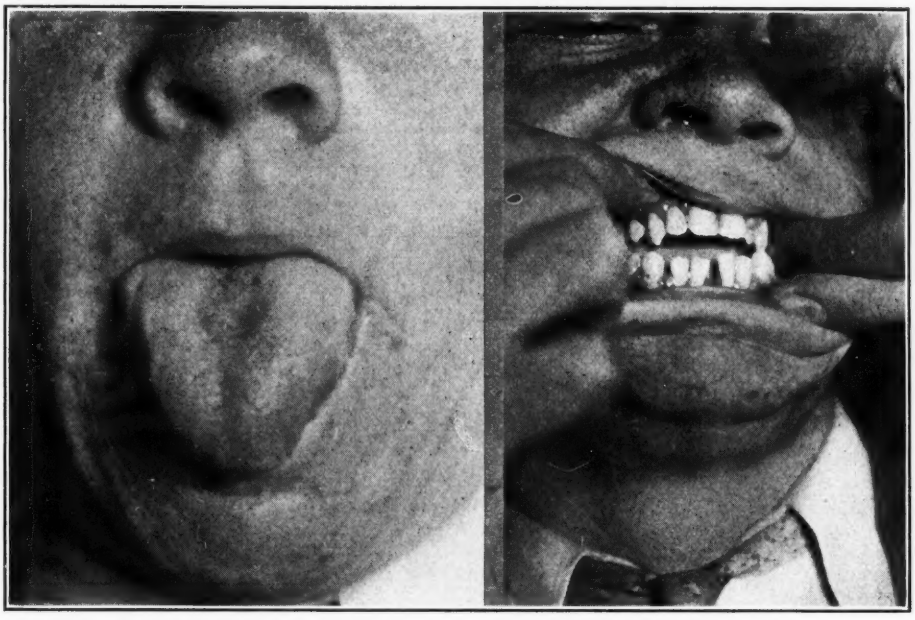

Fig. 13.—Result after marginal resection. Fig. 14.—Notice the position of the tongue after operation.

ular teeth. Notice the protrusion of the lower lip. Fig. 9 shows the enlargement of the tongue and Fig. 10, the tongue resting between the maxillary and mandibular teeth. This was the only place he could keep his tongue when the jaws were closed; from this he developed a so-called open-bite malocclusion. His speech was not clear, and he had developed quite a number of marginal ulcers, which became very sensitive. Because of this inflammatory condition, he was very eager to have something done so he could get relief. This young man also had an enlargement of the left hand, and the left arm was approximately four inches longer than the right and about one inch larger in thickness. Otherwise he was physically normal.

The surgical care for these cases is either to remove a wedge-shaped piece from the tongue or to do a marginal resection. I prefer the latter because the

tongue can be reduced in size without altering its shape or interfering with its musculature. In this patient I did the so-called marginal resection, following the technique of Sampson Handley. A V-shaped incision is made above and below, cutting as much of the margin as is necessary, being careful to remove more from the papillae-bearing dorsum than from the under surface of the tongue. (Fig. 11.) If this is done correctly, the smooth mucous membrane will lie against the teeth and the remaining papilla will then not be irritated.

Fig. 12 shows the piece removed from the margin of the tongue. Fig. 13 shows the tongue reduced considerably in size. His speech became more clear, and the painful condition of his tongue disappeared. You will notice that in Fig. 14 the tongue is lying in its normal position when in rest. The malocclusion of the teeth as is noticed in this picture has been caused entirely by the muscular hypertrophy of the tongue.

Fig. 15.—Lipoma of tongue (Smith). Fig. 16.—Result after operation (Smith).

Tongues, of course, may have tumors like any other part of the body. I wish to report here a very interesting case that was reported in the *Journal of the American Medical Association* by Dr. Ferris Smith.

This was a woman, aged forty-five years, who had a mass the size of an orange on her tongue. She first noticed the growth to be the size of a pea on the right tip of her tongue seventeen years previously. Nine years later the mass had reached such a size that she had to discard her dentures and take soft foods only.

The tumor was round, smooth and moderately pseudofluctuant. It involved the tip and largely replaced the muscle of the right anterior half of the dorsum. The covering had the appearance of a modified squamous epithelium. The tumor could be pushed through a much enlarged mouth into greatly distended cheeks (Fig. 15[5]). This mass was removed by Dr. Smith, and Fig. 16 shows the result sixty days later.

These so-called lipomas grow very slowly. They are usually removed before they become such a size that they are liable to cause a distortion of the mouth or a shifting of the teeth from their normal position.

REFERENCES

1. Dudley, E. C.: Principles and Practice of Gynecology, Philadelphia, 1908, Lea & Febiger.
2. Federspiel, Matthew N.: Report of a Case of a Dermoid Cyst Lying Within the Floor of the Mouth, Dental Cosmos, March, 1917.
3. Blair, Vilray P.: Surgery and Diseases of the Mouth and Jaws, St. Louis, 1917, The C. V. Mosby Co.
4. Fitzwilliams, Duncan C.: The Tongue and Its Diseases, London, 1927, Oxford Medical Publications.
5. Smith, Ferris: Lipoma of the Tongue, J. A. M. A. **108**: 522, 1937.

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Department of Orthodontic Abstracts and Reviews

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Esthetic Corrections of Malpositions by Means of Surgery, Prosthetics, and Rapid Orthodontia. Fritz Schön (Olmütz, C.S.R.), 1937, Ed. 2, Berlinische Verlagsanstalt, Berlin, Germany.

In reviewing it is always preferable to know the author, not so much in a personal way, but through knowledge of his entire scientific writings. Dr. Schön has, as I know, manifested a purely practical conception of the topics discussed in his numerous articles. One realizes that he himself has struggled many hours in order to conceive the theoretical foundation for his articles, but he has always spared the reader the same trouble. This quality of his writings explains the success of his articles and also that of the present book, the principles of which are rapidity, efficiency, and permanency of therapeutic measures. The present unstable and restless times account for such a viewpoint.

Surgical treatment is mainly indicated in replantation of anterior teeth which are rotated or tipped (this method is preferable to the "redessement force"); of teeth which are knocked out through trauma; of teeth which are erroneously extracted; or of teeth which need root canal treatment. The technique consists of extraction (unless the tooth was knocked out) under local anesthesia, after careful surgical detachment of the gingival tissues from the tooth. Then all decay is removed and the root canal is cleaned and filled with gutta-percha, cement, or ebony points. An extensive resection of the apex should be avoided because the success of the replantation is dependent upon close adaptation of the root to the alveolar wall. The crown is then filled with quick setting amalgam, and the surface of the root is carefully smoothed. It is not necessary to retain the periodontal tissues which adhere to the root because they do not participate in the formation of the new bone, but the periodontium attached to the alveolar bone must be safeguarded with utmost care. After the tooth is bathed in rivanol solution and in warm water, it is replaced in the alveolus. After the replantation, rest and fixation are needed; for the latter, the use of wire ligatures or of splints is indicated.

Another surgical treatment is the closing of the diastema through removal of the frenum and the drawing together of the incisors by means of rubber bands. (Such treatment does not always assure satisfactory results because tipping of the crown may occur. A slower movement is indicated with provisions for bodily movement.) Surgical correction of a marked pro-

trusion of the maxillary incisors is illustrated, showing a splendid result. (However, it is questionable whether all similar cases would prove equally satisfactory.) This case is especially interesting because of the fact that the treatment of the patient, a school teacher, had to be completed without interference with her occupation; the operation took place on Saturday and the patient was back at work on Monday morning. The technique was as follows: anesthesia; extraction of five maxillary anterior teeth; surgical removal of the prominent portion of the alveolar process; shortening of the gingival periosteal tissue flap; and sewing together; immediate prosthetic plate. In preparation of this treatment, the abnormal curve of Spee of the mandibular teeth had been corrected by (1) grinding off part of the incisors, removal and filling of the opened root canals, (2) establishment of a new occlusal plane through overlays on premolars and molars.

Dr. Fritz Schön

In cases of extreme crowding and lack of space for canines, the symmetrical extraction of premolars is resorted to and the closing of the spaces produced by the extraction is left to nature. This is necessary in many instances in which economic conditions prevent extensive orthodontic treatment. (Such procedure is a double-edged weapon; one cannot look forward with any degree of assurance to a good esthetic result because troublesome spaces may remain between the teeth.)

The chapter on prosthetics deals with the various methods of improving the appearance of anterior teeth, especially in children from two to fourteen years, after traumatic fractures or in cases of malpositions. Here we find discussed: the ligation and fixation of fractured teeth and of loosened teeth; the placing of porcelain crowns on youthful teeth; immediate bridge service after the loss of incisors. The instructions regarding the staining of artificial

teeth, and the construction of porcelain crowns are valuable though not original. Slight malpositions, rotations, and spacing are corrected by the extensive use of jacket crowns and porcelain bridges.

The most interesting part of the book is the one discussing rapid orthodontia, a favorite subject of the author. In the main, it deals with the use of the inclined plane in the treatment of maxillary incisors which are in lingual occlusion. The inclined plane in itself is nothing new, having been employed by Pierre Fauchard. The author champions a valuable technique, but nevertheless his statement that he has never experienced a root absorption among his numerous cases treated in this manner must be read with caution The results which a gifted hand obtains may not be duplicated by every one. Dr. Schön's instructions refer to the construction and the use of the individual plane, and to its indication. It may be necessary to say a little more about its thickness and extent. (I may also mention that small holes should be provided in the plane in order to remove it easily when its usefulness is past. Besides the oxyphosphate cement, temporary cements may be used, as they give sufficient strength.) The correction of the open-bite in children (most times the result of thumb-sucking) by means of elastic bands should be handled with great care.

Dr. Schön's book can be considered as a short but useful guide for the general practitioner in dentistry who has to act quickly, treat with a minimum of expense, and yet obtain good results.

Henrick Salamon (Budapest.)

Journal of the Canadian Dental Association.

This is the official organ of Canadian Dentistry. It was established in 1935 and is now being distributed to more than 4,000 practicing dentists. The publication office is the Consolidated Press, Ltd., Toronto.

The journal contains 50 pages devoted to scientific articles, which are divided into an English main portion, of which M. H. Garvin, D.D.S., is the editor-in-chief; and a French section, prepared by Alcide Thibaudeon, D.D.S.

A typical issue, that from July, 1937, contains the following articles: "Impacted Mandibular Third Molar," by George A. Morgan; "Dentistry in India," by R. Ahmed; "Infection of the Teeth in Relation to General Health," by John W. Clay; "Electro-Coagulation in the Treatment of Periodontoclasia," by C. Allan Snell; "Antiseptics for Denture Patients," by W. J. Prior.

The French section gives a report of the Congress of the French Speaking Dentists of North America which was held in Montreal in May, 1937, and had an attendance of more than three hundred dentists.

Egon Neustadt.

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A Review of Recent Advances in Oral Pathology

In 1937 experimental pathology has continued to furnish most interesting information regarding the effect of exogenous and endogenous agents on the teeth and other oral structures. It aids in determining how diseases develop; it gives us an opportunity to visualize the process which produces them, and helps in understanding the end-result.

May Mellanby (London) reviews her work and that of others working on the influence of nutrition in caries prophylaxis, and concludes that the quality of the structure of the tooth is of greatest importance, being dependent on nutritional factors during its formation. Therefore it is important to direct our efforts to the development of perfect teeth. She points out that a diet including the extensive use of cereals which contain toxamin has the tendency to prevent calcification, and that with such diet it is important to counteract its effect by the use of increased amounts of food containing vitamin D and calcium salts. With our present knowledge of nutrition it should be possible, she states, to reduce decay.

Von Kreudenstein (Berlin) demonstrated that in parathyroidectomized rats in which the newly formed dentin remains uncalcified, calcification can be effected by other methods than the injection of parathormone. Large doses of irradiated ergosterin or subcutaneous or oral administration of calcium preparations may be substituted for parathyroid hormones. It is merely a matter of raising the calcium content of the blood.

Blockberg and Berke (Columbia University), on the other hand, worked with animals (rats) which were not previously parathyroidectomized. If a normal diet, sufficient in inorganic salts and vitamins was fed, with administration of repeated small doses of parathormone, the pulp showed decided pathology, fibrosis and degeneration of odontoblasts, but the dentin wall was rather thicker than in the controls, and the predentin thinner. The writers think this due to an immunity to parathormone developed by the animals. (The reviewer would expect to see increased calcification of dentin because parathormone raises the level of the blood calcium. The case of a boy affected by hyperparathyroidism with well-calcified teeth was reported by him [Thoma, 1934 and 1936].) Other groups received low calcium and high phosphorus diet without vitamin D,

high calcium and low phosphorus without vitamin D, some with and some without small doses of parathormone with the resultant pulp pathology, rachitic type of calcification of the dentin and bone, being much worse in the group that received the parathormone. In cases of deficient diet, therefore, parathormone seems to augment the defects.

Boyle (Harvard) produced chronic scurvy in guinea pigs by feeding a vitamin C (ascorbutic acid) deficient diet, and found that the jaws and the teeth were affected. Osteoporosis caused a rarefaction of the alveolar bone; the teeth became loose as a result of the effect on the suspending apparatus of the teeth and inflammation of the gingivae.

Pathologic studies to classify and investigate the histologic changes in parodontal disease (pyorrhea) was carried on by Thoma and Goldman (Harvard). By means of abundant autopsy material they found two principal types of processes: marginal parodontitis and parodontosis. The first is purely local resulting from malhygiene of the mouth and involves the gingiva first; the second affects the alveolar bone around the teeth, causing it to revert to fibrous connective tissue from which it originated. This results in loosening and drifting of the teeth. The authors believe that the discovery of the histopathologic changes in parodontosis may lead to the finding of the cause or causes of the disease, and that this will probably be found to be systemic, rather than of a local nature.

Battersby (Nottingham, England) published a survey of complete anodontia cases. These are generally combined with defects of other ectodermal structures, and often inheritance is found to play a part. Inheritance is an important topic in Germany at present, and many interesting publications appear in the medical literature, and dentistry is also furnishing its share. Patients with a pair of teeth missing—most frequently the lateral incisors—have been studied regarding similar taints in their ancestry. It was found that many members of such families were afflicted with similar stigmas through several generations. An interesting report from the Surgical Clinic in Münster, Germany, published by Schröder shows that inheritance plays a great part in cleft palate cases. Of seventy-five cases hereditary factors were found in 42.7 per cent. In eight cases the character was dominant; in twenty-four it was recessive. Of affected parents 40.5 per cent of the children were afflicted. In 5.3 per cent there was a blood relationship between the parents. Another effort to link heredity to dental anomalies was made by Ritter (Breslau) who undertook to breed dogs with different types of dental equipment. He found that by crossing such breeds he could produce abnormal arches as well as irregularities in position and occlusion of the teeth. From this he deducts that many anomalies in human beings may well be caused from the mixing of the races by intermarriage. He also proved that large teeth from one ancestor and small jaws from another may be found in a descendent.

Rabkin (Cincinnati), from a study of skulls of ancient and primitive man (East Africans, Egyptians, Persians, American Indians, South Americans, Pacific Islanders, and other prehistoric peoples), finds that a difference of shape and structure of dental arches, deep and heavy mandibles, thick and compact

bone, and sturdy masticatory apparatus show a lesser tendency to dental disease (caries, parodontal disease) than the light weight individual with thin bone, irregularly shaped jaws, distorted arches and teeth.

Many pathologic reports of rare and interesting diseases affecting the jaws and oral tissues have been published in 1937 in American and in foreign literature. These are too numerous to name here. *The Archives of Clinical Oral Pathology* was established this year, sponsored by the New York Institute of Clinical Oral Pathology founded in 1932. This new dental magazine contains case reports and original articles, and should be of great value to those interested in clinical oral pathology.

The importance of routine examination by a pathologist of all excised tissue has been stressed by several writers. Through the efforts of the American College of Surgeons this is a measure that has been made obligatory when operations are performed in hospitals. Neither clinical nor roentgen diagnosis is entirely reliable in case of tumors, and a biopsy examination should be made. Cases have been reported by Cahn, Thoma and Carpenter and others previously, and this year Thoma and Proctor reported another case in which an odontogenic cyst turned out to be an adamantinoma. Cases of "proud flesh" which later were found to be cancers are not uncommon, and often the mistaken diagnosis prevents the opportunity of early treatment. The cure of cancer depends on early recognition and complete destruction. Several articles were published in this and other journals dealing with the treatment of oral cancer, discussing results gained by excision, coagulation, treatment by x-ray or radium. A combination of various methods is advised. Cancers in the mouth present special difficulties, the bone may be involved by metastasis or direct invasion, and irradiation of soft tissue cancer often produces a loss of recuperating power of the bone which makes even trivial surgical interference, such as simple extraction of a tooth, a dangerous undertaking. It is important to remove all dental infection previous to irradiation to prevent necrosis of the jaw which is so frequently a dangerous aftermath. A case of carcinoma of the maxilla from a primary bronchogenic tumor was reported by Gottlieb (Mount Sinai Hospital, New York). This is another to be added to an interesting group of malignant tumor metastases.

An instructive article correlating clinical pulp tests with microscopic pathology of the dental pulp was published by Stephan (University of Illinois). Gurley and van Huysen (Medical College of Virginia) studied the effect of cavity preparation and filling material on the pulp. They showed that filling cavities with cements or temporary stopping is followed by changes in the underlying pulp and dentin histology. Destructive changes are evident when fillings and cavity lie close, but secondary dentin is deposited when placed at a distance from the pulp, a phenomenon which may be observed at different places in one tooth.

Brinch (Copenhagen) described new, formerly unknown pathologic tissue changes in the pulp and periodontal tissue in a case of scurvy. Logan (Chicago College of Dental Surgery) reported on the investigation of pulps and investing tissues in completely embedded teeth. He found no evidence of inflammatory reaction or bacteria in such teeth.

Multiple cysts are not uncommon. Certain individuals seem to have a tendency to cyst formation. An unusual case of multiple dentigerous cysts was reported by Bennett (Tucson, Arizona). A paper dealing with median cysts, especially very large ones, has been published by Stafne and Austin (Mayo Clinic). Four cases are reported, and the authors point out that median cysts, when continuing to grow, may encroach on the roots of the anterior teeth so that it is difficult to distinguish them from radicular cysts. They also may in developing encroach on, or envelop unerupted supernumerary teeth; though there is no doubt that dentigerous cysts may form from so-called mesodens in this location. Incisive canal cysts and odontogenic cysts should be differentiated from facial cleft cysts. Thoma (Harvard) described two types of the latter: one the median cyst which is located in the alveolar part of the maxilla forming from epithelial cells enclaved in the median suture; the other the globulomaxillary cyst which develops between the lateral incisor and the cuspid, causing these teeth to diverge and is caused by similar epithelial enclavement at the junction of the globular (premaxilla) and maxillary processes. A cyst which forms over the incisive foramen and not inside the incisive canal has also been described by Thoma. This is the cyst of the papilla palatina. These, like the ranula and the labial cysts, are filled with mucus. They cannot be visualized in an x-ray picture.

The theory that infection of deciduous teeth may produce effects on the enamel organ of permanent teeth resulting in formation of dentigerous cysts finds new support in the examination of necropsy material. A case is reported by Morningstar (University of Vienna). The patient died of miliary tuberculosis and myelogenous leucemia. He found cyst formation in the inflammatory tissue between the roots of the deciduous tooth and a marked effect on the epithelial cells of the enamel organ of the developing premolar.

REFERENCES

Battersby, J.: Ectodermal Dysplasia With Complete Anodontia, Dental Magazine & Oral Topics **53**: 427, 1936.

Bennett, P. H.: Multiple Dentigerous Cysts, J. A. D. A. **24**: 894, 1937.

Blockberg, S. N., and Berke, J. O.: Influence of Parathormone on the Production of Dental Caries in Rats, J. Dent. Res. **16**: 191, 1937.

Boyle, P. E.: Experimental Scurvy in Guinea Pigs and Its Relation to Diffuse Alveolar Atrophy in Human Subjects, Harvard Dental Record **11**: 5, 1937.

Brinch, O.: Über einige bisher unbekannte pathologische Gewebs veränderungen in der Pulpa und im Paradentium in einem Fall von Skorbut, Deutsche Zahn. Mund. u. Kieferhlk. **4**: 20, 1937.

Gottlieb, M.: Metastatic Carcinoma of the Upper Jaw From a Primary Bronchogenetic Tumor, J. A. D. A. **24**: 1075, 1937.

Gurley, W. B., and van Huysen, G.: Histologic Changes in Teeth Due to Plastic Filling Materials, J. A. D. A. **24**: 1806, 1937.

von Kreudenstein, T. S.: Über die Beeinflussung der Dentinverkalkung durch orale und parentale Kalkzufuhr, Deutsch. Zahn. Mund. u. Kieferhlk. **4**: 200, 1937.

Logan, W. H. G.: Are Pulps and Investing Tissues of Completely Embedded Teeth Infected, J. A. D. A. **24**: 853, 1937.

Mellanby, M.: Der Enährungsfaktor in der Kariesprophylaxe, Deutche Zahn. Mund. u. Kieferhlk. **4**: 1, 1937.

Morningstar, C. H.: Effect of Infection of the Deciduous Molar on the Permanent Tooth Germ, J. A. D. A. **24**: 786, 1937.

Rabkin, S.: Cranial Structural Variations and Their Association With Dental Conditions, J. Dent. Res. **16**: 203, 1937.

Ritter, R.: Können Anomalien des Gebisses Gezüchtet werden, Deutsche Zahn. Mund. u. Kieferhlk. **4**: 235, 1937.

Schröder, C. H.: Untersuchungen über die Vererbung der Hasenscharte und Gaumenspalte, mit besonderer Berücksichtigung des Erbganges, Arch. Klin. Chir. **182**: 299, 1935.
Stafne, E. C., and Austin, L. T.: Further Observations on Median Anterior Maxillary Cysts, J. A. D. A. **24**: 957, 1937.
Stephan, R. M.: Correlations of Clinical Tests With Microscopic Pathology of the Dental Pulp, J. Dent. Res. **16**: 267, 1937.
Thoma, K. H.: Facial Cleft or Fissural Cysts, INTERNAT. J. ORTHO. **23**: 83, 1937.
Idem: Cyst of the Papilla Palatina, INTERNAT. J. ORTHO. **23**: 521, 1937.
Idem: Clinical Pathology of the Jaws, page 174, Springfield, Illinois, 1934, Charles C. Thomas Co.
Idem: A Case of Generalized Osteitis Fibrosa Demonstrating the Effect of Hyperparathyroidism on Tooth Development, INTERNAT. J. ORTHO. **22**: 400, 1936.
Idem and Goldman, H. M.: Classification and Histopathology of Parodontal Diseases, J. A. D. A. **24**: 1937.
Idem and Proctor, C. M.: Adamantinoma Developing From Odontogenic Cyst, INTERNAT. J. ORTHO. **23**: 307, 1937.

Editorial

The Developments in Health Service

IT has been estimated that America spends between three and four billion dollars a year on medical care. It seems, on casual observation, that such an amount equitably distributed should go a long way toward providing good medical service for the people, at the same time insuring adequate compensation for those engaged in the health professions. Nevertheless, this is not the case. The professions are conscious that something is wrong with the whole fee system and with the distribution of health services. Socially minded physicians realize the need for adequate health service for *all the people;* and, with socialized medicine on the front page for the past several years, the whole problem is focusing itself more directly on the medical profession, and demands a solution, or at least steps directed toward a solution.

No doubt many would welcome a change in the present system of fees, provided government control of practice is not introduced. All along, the health professions have been opposed to any form of government control, believing that politics would break down the efficiency of professional services and would decrease the rewards of such services. But it now seems that the report of the American Foundation published last spring entitled "American Medicine—Expert Testimony out of Court," which was widely discussed by medical groups everywhere, has started action within the medical profession itself. In addition, the publicity recently given various plans for establishing medical cooperation *without government aid* has aided in getting the medical profession to fall in line and attempt to do something about the problem.

A group of well-known medical men have now submitted independent conclusions, and have advanced proposals for obtaining cooperation between the government and physicians, to result in a far-reaching national medical policy. The main principles have been forwarded to the American Medical Association, according to Dr. Winternitz, former dean of the Yale School of Medicine, in the hope that the American Medical Association will recognize the need of a cooperative effort on the part of the medical profession's socio-economists and the government, and that there may be created thereby a broad, comprehensive program of health organization. The foremost suggestion proposed is that the health of all the people, not just of the underprivileged, is the direct concern of the government, and a national health program should be created only upon such a broad basis.

This is surely a step forward in the approach to the present problem, a problem inevitably demanding a sane and sound solution because it represents another outbreak of the present disruption of orthodox human relations and illustrates the inadequacy of present economic systems to fit a changing world.

This medical problem will finally be solved successfully by the joint efforts of human ethics, scientific medicine, sociology, and economics. Eventually a plan will be evolved with government cooperation and the Bill of Rights as the guiding star to health service for *all the people.*

The dental profession will watch with great interest the action of the medical profession during this crisis, the outcome of which will probably establish the future trend of all health service.

H. C. P.

News and Notes

Harvard Society of Orthodontists

The semiannual meeting and dinner of the Harvard Society of Orthodontists will be held at Vanderbilt Hall, 107 Louis Pasteur Ave., Boston, on January 12, 1938, at 6:30 o'clock. All ethical members of the dental and medical professions are cordially invited.

DR. HAROLD J. NICE, Secretary
475 Commonwealth Avenue
Boston, Mass.

Dallas Midwinter Dental Clinic

The eleventh annual meeting of the Dallas Midwinter Dental Clinic, sponsored by the Dallas County Dental Society, will be held at the Hotel Adolphus, Dallas, Texas, January 17, 18 and 19, 1938.

Four outstanding, nationally known clinicians will conduct the courses: Dr. C. W. Hoffer, Nashville, "Restorative Dentistry, Including Inlay and Crown Bridge Technique"; Dr. Claude Cannon, Fayette, Alabama, "Manipulation and Insertion of Amalgam, and Amalgam as a Filling Material"; Dr. John W. Seybold, Denver, "Dental Infections as a Factor in Systemic Disease"; Dr. Edward B. Spalding, Detroit, "Principles of Partial Denture—Design and Construction."

A card showing membership to American Dental Association will be necessary for admission to these sessions. For additional information, write Dr. T. A. Lipscomb, 1614 Medical Arts Bldg., Dallas, Texas.

North Atlantic Orthodontic Society

The next meeting of the North Atlantic Orthodontic Society will be held in the Hotel Pennsylvania, New York City, on Wednesday afternoon and evening, January 26, 1938, starting at 2 P.M. All members of the profession are most cordially invited to be present.

DR. EDWARD A. LUSTERMAN, Secretary
185 West End Avenue
Brooklyn, N. Y.

International College of Dentists

The next annual meeting of the International College of Dentists, United States Section, will be held at the Stevens Hotel in Chicago, February 13, 1938.

DR. ELMER S. BEST, Registrar
801 Medical Arts Bldg.
Minneapolis, Minn.

Rocky Mountain Society of Orthodontists

The Rocky Mountain Society of Orthodontists will hold its midwinter meeting at the Shirley-Savoy Hotel, Denver, January 9-12, 1938. Dr. John C. Rosnik, 1014 Republic Building, Denver, is in charge of the arrangements.

DR. ALBERT P. HORTON, General Chairman,
206 Metropolitan Building,
Denver, Colo.

DR. C. E. WESTERBERG, Secretary-Treasurer,
846 Metropolitan Building,
Denver, Colo.

Five State Post Graduate Clinic

The District of Columbia Dental Society will conduct the Five State Post Graduate Clinic on March 6-9, 1938, at the Mayflower Hotel, Washington, D. C.

Southern Society of Orthodontists

The sixteenth annual meeting of the Southern Society of Orthodontists will be held at the Hotel Cleveland, Spartanburg, South Carolina, on February 7 and 8, 1938. All ethical members of the dental and medical professions are cordially invited.

CLYDE O. WELLS, President,
828 Montgomery Building,
Spartanburg, S. C.

WILLIAM P. WOOD, JR., Secretary,
442 W. Lafayette Street,
Tampa, Florida.

North Carolina Dental Society

The sixty-fourth annual meeting of the North Carolina Dental Society will be held at the Robert E. Lee Hotel in Winston-Salem, N. C., May 2-4, 1938. All members of the American Dental Association are cordially invited to attend.

FRANK O. ALFORD, Sec.-Treas.,
1109 First National Bank Bldg.,
Charlotte, N. C.

Thos. P. Hinman Midwinter Clinic

The twenty-fourth annual session of the Thos. P. Hinman Midwinter Clinic will be held at the Biltmore Hotel, Atlanta, Ga., March 14 and 15, 1938.

Dental School of National University of Mexico

In August there was organized a scientific educational society called the Association of Professors of the Dental School of the National University of Mexico. The following officers were elected to serve for the next two years: President, Dr. Miguel Diaz Mercado; Secretary, Dr. Guillermo S. Gamboa; Treasurer, Dr. Aurelio Galindo.

Dr. G. S. Gamboa, Secretary
Av. 16 de Septiembre 354
Mexico, D. F.

Eastern Association of Graduates of Angle School of Orthodontia

The annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held at the Boston Medical Library, Boston, Mass., on Monday and Tuesday, January 24 and 25, 1938.

Dr. E. Santley Butler, Secretary
55 Locust Avenue
New Rochelle, N. Y.

Note of Interest

Dr. Bernard A. Haimovitz announces the opening of his office at 1308 Medical Arts Bldg., Philadelphia, Pa. Practice limited to orthodontia.

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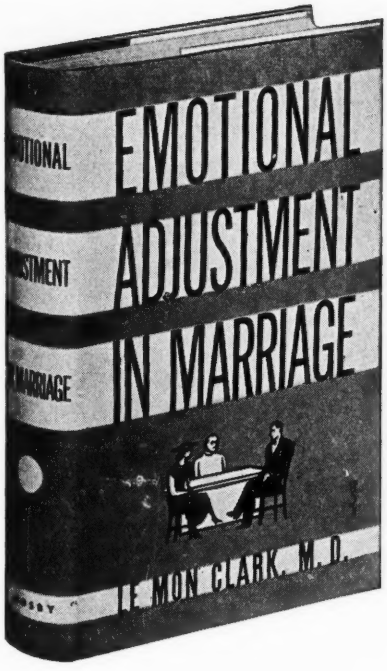

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